

Machine and Tool **BLUE BOOK**

A DIGEST OF THE METAL WORKING INDUSTRY

APRIL 1947

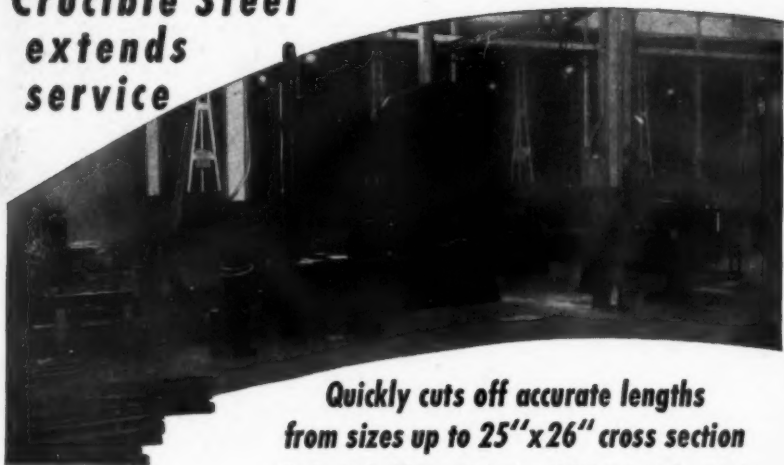
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A HITCHCOCK PUBLICATION

Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

No. 24 MARVEL giant Hydraulic Hack Saw. (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type in sizes up to 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

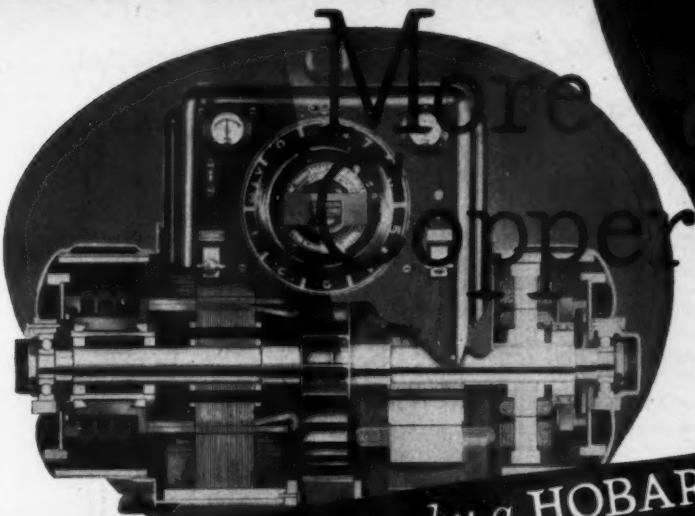
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.



MARVEL SAWS



...another reason why a HOBART
cooler; welds faster

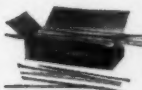
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offered in a wide range
of sizes — stationary
or portable mountings.



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furnished on various
types of mounting—
in some very original
and useful types.



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quality of your welds—
no matter what kind
of work you are doing.



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in their make-up that they have to
operate at twice the speed of a Hobart.

Hobart uses PLENTY of copper, and
operates at a safe, reasonable speed.

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and ability to weld at maximum
speed with extraordinary economy.

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- MILLING
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- TAPER TURNING

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The Rivett No. 608 back-gear, screw cutting lathe for tool making and instrument shops, handles an endless variety of jobs in minimum time. This small but exceedingly proficient lathe with slide areas equal to that of one twice its size, permits the operator to finish his work completely without employing other machines.

WRITE FOR BULLETIN NO. 608



GUARANTEE

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collar, and turn between centers within 0.0001" in six inches. It will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. It will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

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ELMIRA, N.Y.

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Time and money can be saved when tool room collet work of one-inch diameter or less is not done on heavy lathes. Here is how:

SAVE TIME — by avoiding use of slower machines designed to produce large work.

SAVE MONEY — by prevention of under-capacity production on more expensive machines which consume excess power and waste floor space for size of work involved.

HARDINGE High Speed Precision Tool Room Lathes can save both time and money and return profits proportionate to machine investment, because it is the proper size tool room lathe for collet work one-inch or less. Furthermore, HARDINGE assures extreme accuracy, high spindle speeds and ease of operation.

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Whether yours is a "job" or a "position" you are vitally concerned with profits, for it's from profits that wages and salaries are paid. Personally concerned with profits, you should be interested in ARMSTRONG TOOL HOLDERS for they permit extra profits on every operation on lathes, planers, slotters and shapers.

Before ARMSTRONG TOOL HOLDERS, a blacksmith hammered out special tools for each operation, while men and machines stood idle, as he fashioned, re-sharpened and re-tempered these cumbersome forgings. Now, with multi-purpose ARMSTRONG TOOL HOLDERS, any mechanic can grind his own cutter-bits from standard high speed steel shapes. Tooling-up is a matter of minutes, with savings of "All Forging,

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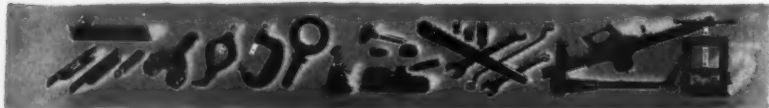
Today there are ARMSTRONG TOOL HOLDERS for every operation, including special tool holders for cast-alloy and carbide-tipped cutters. Embodying the "Knowhow" developed thru more than 50 years of specialization, they do every operation faster, safer, more accurately . . . at lower cost and a higher profit.

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ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

308 N. Francisco Ave., Chicago 12, U.S.A.
San Francisco and New York



Machine and Tool BLUE BOOK

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APRIL, 1947

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New York, Metropolitan Area: A. E. Wailes, 55 W. 42nd St., New York 18, N. Y.,
 Phone Lackawanna 4-4528
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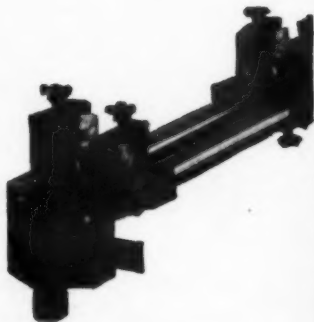
ABC's

OF BAR GRINDING FIXTURES for Cincinnati Centerless Grinders

How long is long? In centerless grinding operations on bars, tubes and rods, it's about 15 inches, for beyond that length, such work requires its own distinctive Long Bar Grinding Fixture. Shops equipped with CINCINNATI Centerless Grinders have a choice of four general types:

- Type A—for comparatively short bars of small diameters.
- Type B—for medium diameter, medium length bars.
- Type C—for long, medium diameter bars.
- Type D—for long, large diameter bars (No. 3 Centerless only).
- For nonmetallic tubes and rods (capacity, $\frac{1}{8}$ " to 3" diameters, lengths up to 5 feet).

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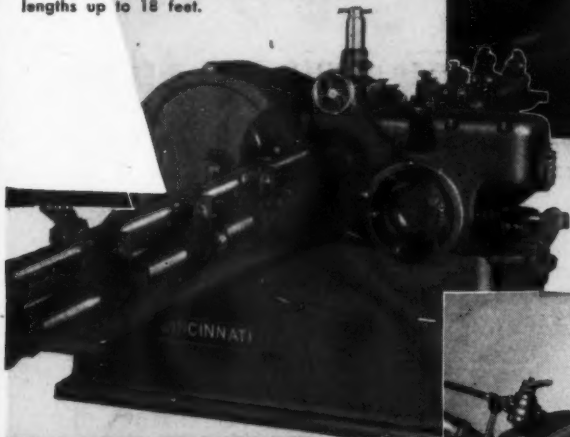


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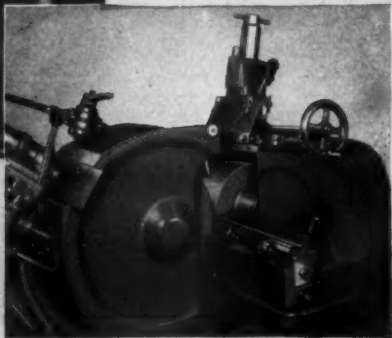
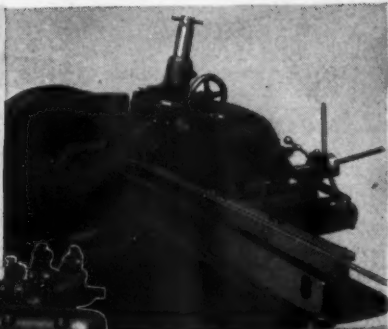
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CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Type D: Long Bar Fixture (for No. 3 Centerless). Capacity 1" to 4" diameters, lengths up to 18 feet.



Type B: Long Bar Fixture. Capacity $\frac{1}{8}$ " to $1\frac{1}{4}$ " diameters, lengths up to 8 feet.



Type A: Long Bar Fixture. Capacity $\frac{1}{8}$ " to $1\frac{1}{4}$ " diameters, lengths up to $2\frac{1}{2}$ feet.

Type C: Long Bar Fixture. Capacity $\frac{1}{2}$ " to 2" diameters, lengths up to 18 feet.



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The **RUGGED - TROUBLE-FREE DI-SAW**



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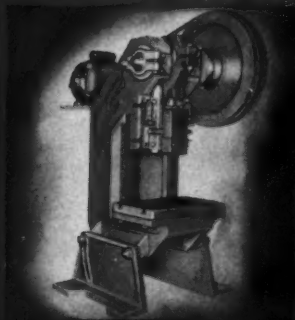
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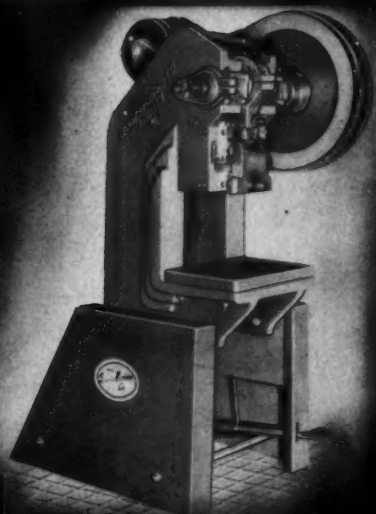


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Even on today's toughest Steels CSM's give you Astounding

**Slot in S.A.E. 3145 Forging
Milled in one pass — metal
removal: 21.8 cubic inches
per minute!**

WORKPIECE: Connecting link used in mining machinery

MATERIAL: S.A.E. 3145 Forging

HARDNESS: 190-200 Bhn

OPERATION: Mill slot $1\frac{1}{2}$ " wide x $2\frac{3}{4}$ " deep*

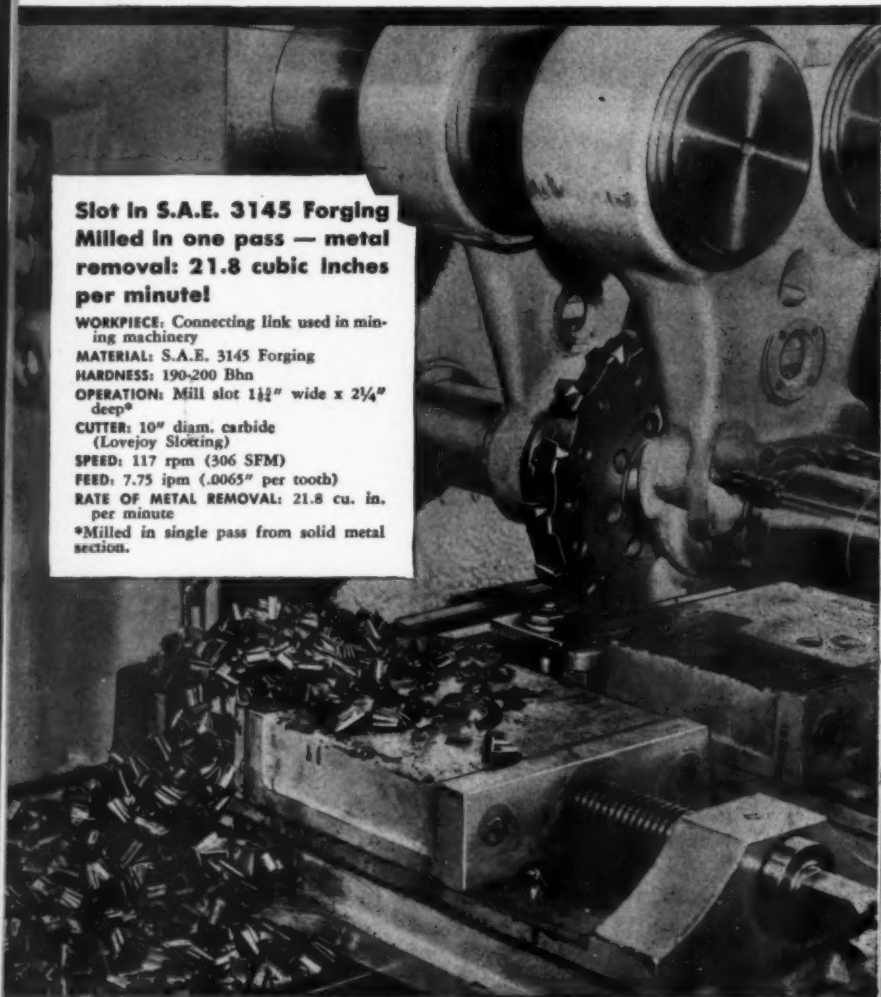
CUTTER: 10" diam. carbide
(Lovejoy Slotting)

SPEED: 117 rpm (306 SFM)

FEED: 7.75 ipm (.0065" per tooth)

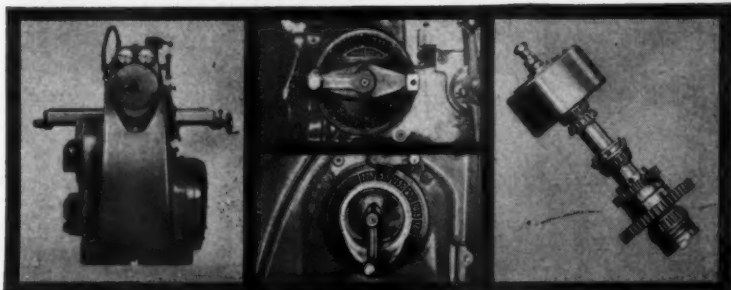
RATE OF METAL REMOVAL: 21.8 cu. in.
per minute

*Milled in single pass from solid metal section.



Kearney & Trecker super-power new rates of metal removal!

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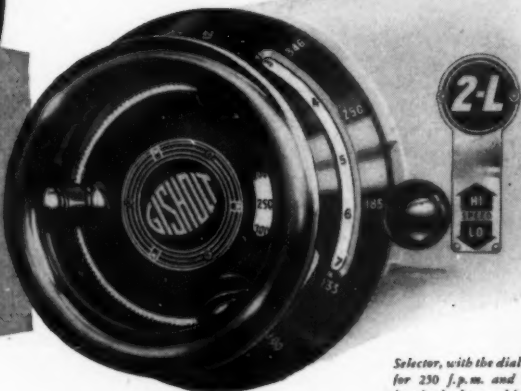
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477



HYDRAULIC SPEED SELECTOR



Selector, with the dial set for 230 f.p.m. and the hand wheel turned for a cut of 5/16-inch diameter.

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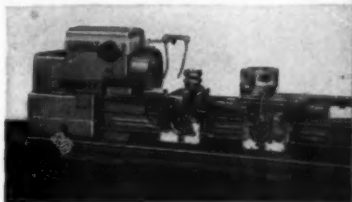
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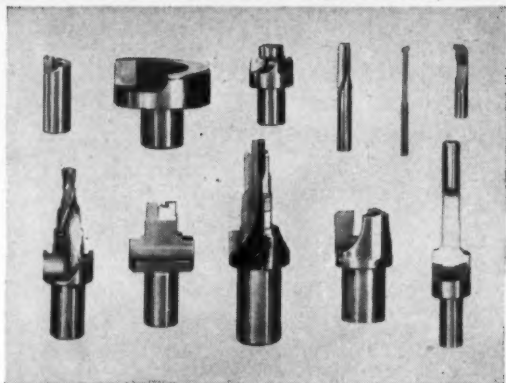
Send for our new catalog MFTI

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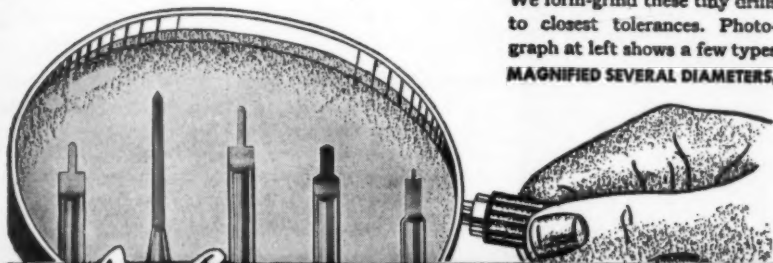
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We form-grind these tiny drills to closest tolerances. Photograph at left shows a few types **MAGNIFIED SEVERAL DIAMETERS,**



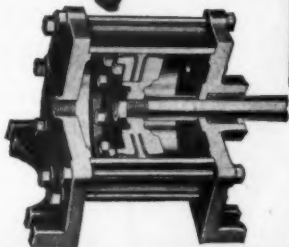
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C/R Hammers have malleable iron heads with replaceable coiled rawhide faces.



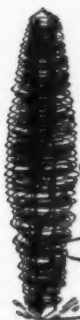
CHICAGO Rawhide MFG.CO.

1321 ELSTON AVENUE

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Other C/R maintenance products are: round, flat and twist belting; belt pins and belt lacing; gears, pinions and gear blanks; aprons and hand leathers; hydraulic packings.

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precision
DRILLING



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CHICAGO HEIGHTS, ILLINOIS



DRILL PRESSES

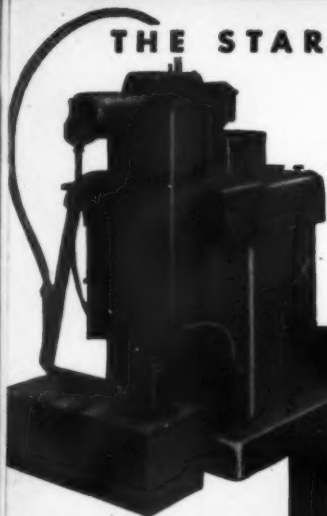


When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

THE START OF A . . .

GOOD COOLANT SYSTEM

Photos Courtesy The Taft-Peirce Mfg. Co.,
Woonsocket, R. I.
Hardinge Bros., Inc., Elmira, N. Y.



RUTHMAN GUSHER COOLANT PUMPS

The efficiency of any coolant system depends entirely on the efficiency of the Pump that controls it. Here Ruthman Gusher Coolant Pumps are outstanding. Split second coolant control, long trouble-free life, and vibrationless rigidity are among the outstanding qualities that have made Gusher Pumps preferred by the leading machine tool manufacturers.

Illustrated above left is a Model 1-P3 Long Gusher Coolant Pump on a Taft Peirce No. 6 Rotary Surface Grinder. To the right is a Model 1-P3 Short Gusher Coolant Pump on a Hardinge DSM59 H. S. Precision Second Operation Machine.



THE RUTHMAN MACHINERY CO.



Write for Catalog 10-G

1816 Reading Road, Cincinnati, Ohio

SUN "JOB PROVED" PRODUCTS CUT COSTS SPEED PRODUCTION IMPROVE QUALITY

Proof of the value of any industrial product lies in the experience that practical men have had with it. Sun products have been "Job Proved" in the lubrication of almost every type of mining, manufacturing, power and transportation equipment — in refrigeration and air-conditioning; in metal cutting, tempering and quenching; in the processing of textile fibers, leather, natural and synthetic rubbers; in the impregnation of electrical, electronic, and packaging materials.

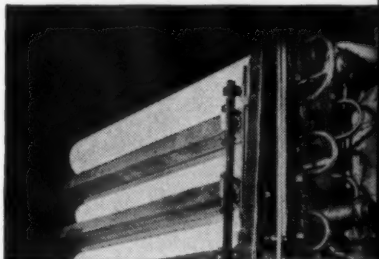
In helping you find solutions to problems in any of these fields, Sun Oil Company offers a wide selection of "Job Proved" petroleum products, plus the experience of Sun Engineers. Detailed product information and the know-how of Sun's engineers are yours for the asking, without obligation. Telephone your local Sun office, or write Dept. MT4 . . .

SUN OIL COMPANY
Philadelphia 3, Pa.

 **SUN**
INDUSTRIAL PRODUCTS



ALUMINUM PARTS MANUFACTURER increased production 43% by using a Sun cutting oil.



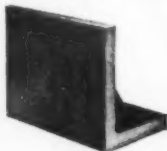
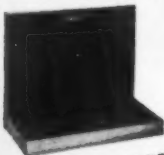
PAPER MILL slashed annual lubrication bill \$2874 by using a Sun Grease.

A TEXTILE MILL increased slashing speed 60% by adopting a Sun Processing Oil.



CHALLENGE SURFACE PLATE EQUIPMENT *for* PRECISION WORK

ANGLE PLATES
22 Sizes— $3\frac{1}{2} \times 4 \times 4$
in. to $24 \times 24 \times 24$ in.



BOX PARALLELS—18 Sizes
From $1\frac{1}{2} \times 2 \times 4$ in. to $12 \times 12 \times 24$ in.



V-BLOCKS—7 Sizes
From $2 \times 2 \times 5$ in. to $12 \times 12 \times 12$ in.



SOLID PARALLELS—
14 Sizes—From $\frac{1}{4} \times \frac{1}{2} \times 6$ in.
to $1\frac{1}{4} \times 2 \times 12$ in.



UNIVERSAL IRONS—4 Sizes
From $4 \times 5 \times 3\frac{1}{4}$ in. to $8 \times 10 \times 5\frac{1}{4}$ in.



Want Trouble-Free Production? — Use Challenge Surface Plate Equipment!

Made from fine-grained, special analysis semi-steel castings, specially heat-treated and precision ground to the required accuracy.

How They Serve —

Universal Right Angle Irons for providing square reference lines... Angle Plates for clamping and holding work... Box and Solid Parallels for setting and leveling to parallel and exact height for checking and inspection... and V-Blocks for supporting shafts and other cylindrical work when drilling, checking, inspecting, etc.

Write for Catalog of Challenge Surface Plate Equipment Today!

We rescope and regrind surface and layout plates—Write for details of this service.

THE CHALLENGE MACHINERY CO.

"Over Fifty Years of Precision Equipment Manufacture"

Main Office and Factory — GRAND HAVEN, MICHIGAN

RAPID WORK... QUICK CHANGE



with Continental Counterbores...

You can reduce your tool cost, improve accuracy, and increase production with the Continental complete line of standard interchangeable cutting tools. Cutters have a balanced, indestructible drive—originated by Continental—that will not stick, will not break, and is hand detachable.

CONTINENTAL TOOL WORKS

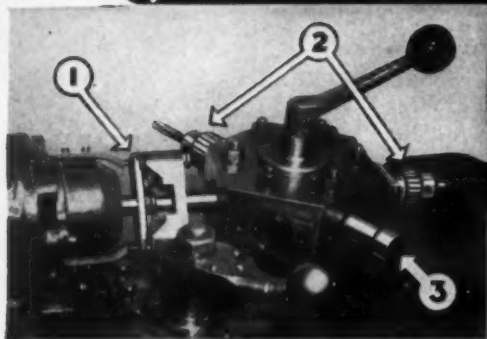
Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN



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You'll **SAVE TIME and MONEY**



WITH
Barnaby
TOOLS

ON
**SCREW MACHINES
AND
TURRET LATHES**

MANY exclusive cost-cutting advantages are offered by Barnaby tools for screw machines and turret lathes. Take the typical set-up illustrated:

1 BARNABY SELF-CLOSING KNURLING TOOL gives extra-fast precision knurling behind shoulders as on the job shown, or anywhere on the work—without back rests. Operates from **turret**; no special camming needed. Minimum set-up time required.

2 BARNABY CHUCK-TYPE FLOATING HOLDER permits quick alignment of drills, reamers, etc. Three-jawed chuck cuts tool-change time to minimum.

3 BARNABY ROTARY STOCK STOP eliminates friction between stock and stop. Unusually compact and sturdy; has absolutely no backlash. Furnished as shown, or with floating construction and head fitted to formed or tapered stock end.

OTHER BARNABY TOOLS include "Jam-Proof" Non-Releasing Tap Holders—Conventional Floating Holders—Hinged-Shoe Tool Holder Bushings (with shoe fastened permanently to bushing)—Inside Adjustable Gages for toolroom, inspection or production department use—and table-type Barnaby Speed Gage, replacing 10 or more conventional snap gages.



Write for full details.

BARNABY MANUFACTURING and TOOL COMPANY
70 KNOWLTON STREET - - - BRIDGEPORT 8, CONNECTICUT

INGERSOLL *Shear Clear*

Carbide Tipped FACE MILLS FOR HIGHER FEED RATES MILLING
• Iron • Aluminum • Steel

The Ingersoll patented Shear Clear face mill is now available with special angles for milling either cast iron, aluminum, or even steel with carbide tipped blades. It is now possible to mill steel with positive angles using carbides if there is sufficient rigidity in machine and fixture.

Carbide cast iron Shear Clears are now milling cylinder blocks, crank cases, transmission cases, flat irons, etc., at feed rates up to 48" per minute, and special cutters can be designed for

higher feed rates if power is available.

Feed rates and cutting speed are almost unlimited with Ingersoll carbide tipped Shear Clears milling aluminum. Machine rather than cutter is limiting factor.

The steel carbide Shear Clear is particularly intended for rough and finish cuts on steel weldments. The unique combination of cutting angles controls chip flow and protects entering angle to maintain cutting edges on carbide tip.

Write for Catalog No. "55E" describing these and other Ingersoll inserted blade milling cutters with high speed steel, cast alloy, or carbide tipped blades.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS



FINISHING CAST IRON



ROUGHING CAST IRON



ROUGHING STEEL



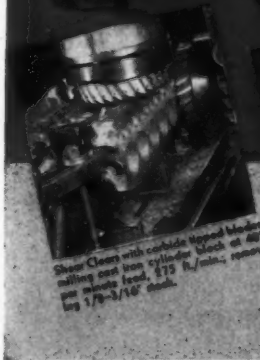
ROUGHING CAST IRON



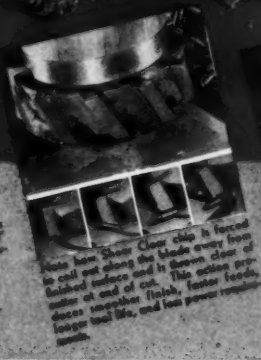
ONE CUT ALUMINUM



FINISHING CAST IRON



Shear Clears with carbide tipped blades milling cast iron cylinder block at 40' per minute feed, 875 ft/min, removing 1/8-3/16" finish.



Note how Shear Clear chip is forced to curl out along the blade every hour leaving a finished surface and a clean clear of cutter at end of cut. This action produces smoother finish, faster feeds, longer tool life, and less power required.



Milling SAE 2330 test block with 10' diameter Carbide Tipped Shear Clear, 1/2" diam, 1/2" wide cut, 300 ft/min, 1/8" feed, 100 horsepower.



Presenting

**THE FIRST COMPLETE
HYDRAULIC DUPLICATING
UNIT FOR ANY MILLING
MACHINE**

THE CLINTON HYDRAULIC DUPLICATORS

The first workable high speed head hydraulic duplicator was designed by our Mr. Walker as was this one. Clinton duplicators are also built for machine tools such as: **BORING MILLS**

**OUR
DUPLICATORS
DO NOT
COST
THEY PAY
OFF**

Write For Complete Information

No longer is it necessary to buy the milling head some where else for our duplicator.

We furnish the complete equipment for your mill as one unit of our own make.

**MANUFACTURED
UNDER
WALKER-TURCHAN
PATENTS**

**LATHES
PLANERS
SHAPERS
GRINDERS**

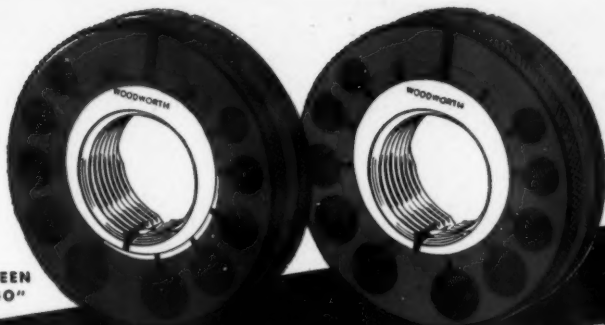
Will duplicate accurately uneven surfaces from even a soft model of wood or plaster.

Quick Delivery

Send blue print of job to be done, no obligation
Hydraulic Is Our Business

THE CLINTON MACHINE TOOL COMPANY, INC.
Clinton at Sixth, Clinton, Indiana

GREEN
"GO"



RED
"NOT GO"
Pat. Pending

~~NEW TESTED~~-ACCEPTED THREAD RING GAGES

5-PLUS FEATURES

- 1 Greater accuracy and stability
- 2 Longer wear life
- 3 Less weight
- 4 Positive identification
- 5 Positive adjustment

ACCURACY YOU CAN TRUST

WOODWORTH RING GAGES STILL PROVING "ON THE JOB" SUPREMACY OVER ORDINARY GAGES

No wonder more and more industries are adopting this gage as standard. Its revolutionary design assures wear life 5 to 7 times longer. And maintains accurate inspection.

This *proved* gage is easy to adjust, light in weight, durable—it's a *must* for cutting costs, increasing production. Just try the Woodworth Thread Ring Gage on your extra tough job—and you, too, will standardize!

Wire or write for folder No. 46R
at no obligation.

WOODWORTH

N. A. WOODWORTH CO. SALES DIVISION, 1306 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINE PARTS • DIAPHRAGM CHUCKS • ADJUSTABLE CLAMPING RIGS • SPECIAL TOOLS

When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

27



ADAPTABLE

Hisey Wide Range Precision Grinders can be quickly and easily mounted on lathes, boring machines, milling machines, etc. to take care of all sorts of internal, external and surface grinding operations.

UNIFORM

Constant speed motor provides uniform grinding speeds to give you satisfactory grinding results. Available in sizes from $\frac{1}{4}$ to 10 H.P.

ACCURATE

Rigid construction assures you of accuracy for both production and tool room operations.

Write for Catalog—70AM



3 H.P. grinder with wheel head for external and surface grinding operations.



1 H.P. grinder with 16 inch long enclosed spindle for internal grinding.



Open type spindle can be furnished instead of spindle as shown on machines.

Hisey


1896 ★ 1947


THE HISEY-WOLF MACHINE CO.
CINCINNATI, OHIO

Because They Are
More Than
TWICE AS RIGID

These Grooving Tool Blades Are

**TWENTY TIMES
AS PRODUCTIVE**



 Weaving—major cause of excessive wear in slender grooving tool blades—can now be overcome by using sturdy, hard blades of solid Kennametal. Here's one example—

In a large automobile plant, solid Kennametal blades are now cutting piston ring grooves in 18,000 to 20,000 aluminum alloy pistons before resharpening, whereas the previously-used carbide-tipped steel-shank blades had to be serviced after cutting grooves in 500 pistons.

These new solid Kennametal blades cut better, longer, not simply because they are much harder than steel, but primarily because their resistance to deflection is two to three times as great as steel. Weaving that causes erratic cutting pressures, strains, and rapid cutting edge failure is thereby minimized.

Kennametal grooving tool blades are made in standard widths from .080" to 250". Other sizes are available. Ask our nearest representative, or write for prices and particulars.



KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

NOW the ELECTRIC SHOPLIFTER

**Industry's favorite all-purpose
lifter now powered for continuous duty service**



The electric SHOPLIFTER has been engineered for those continuous duty jobs where a hand operated hoist is impractical or unduly tiring to the operator. To operate the lifter, plug the conductor cord into the nearest lamp socket, then turn the controller handle to the "up" or "down" position—that's all there is to it; the power unit does the lifting. Anyone can operate the electric SHOPLIFTER with perfect safety and without fatigue.

Motor— $\frac{1}{3}$ horsepower reversing type, built to NEMA specifications, 110 volt, single phase, 60 cycle AC, for lamp socket operation only. Platform speed—10 feet per minute.

Platform—steel plate, 24" x 24". Overall height—6'0". Platform lift—4'6".

Price—Complete machine, \$397.50 f.o.b. Chicago with freight allowed. (Foot operated Floor Lock \$10.00 extra). Hand operated SHOPLIFTER, \$157.50.

Other Economy Lifting Machines of heavier capacities up to 5000 lbs. available.

PROMPT DELIVERY

Write for catalog.

2635 W. Van Buren St., Chicago 12, Ill.

ECONOMY ENGINEERING CO.

OLIVER 510 Drill Pointer

ACCURATE •

GREATER EFFICIENCY
IN PRODUCTION!

ECONOMICAL

*Send Us a Few of Your
Drills to Sharpen for Tests*

Excessive drill costs and imperfect holes, in most cases, can be traced to improper grinding of the drill points.

MACHINE GRINDING has proven a more accurate method of sharpening drills. Properly machine ground, a drill will cut faster, produce more accurate holes and last longer than if ground by hand.

THE OLIVER 510 DRILL POINTER will grind all drills from $\frac{1}{4}$ " to 3" with the proper point angle and clearance. AUTOMATIC OPERATION.

OLIVER INSTRUMENT CO.

1408 E. MAUMEE ST.

ADRIAN, MICH.

IMPROVE YOUR TOOLROOM
IT'S THE BACKBONE
OF PRODUCTION

WRITE FOR
CATALOGUE

OLIVER
OF ADRIAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL
POINT THINNERS—TEMPLATE
TOOL GRINDERS—FACE MILL
GRINDERS—DIEMAKING MACHINES

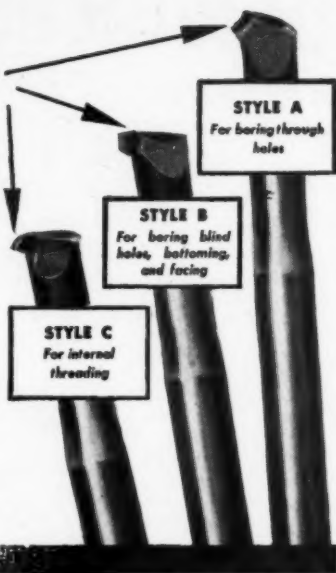


**YOU RESHARPEN
ONLY ONE FACE
OF
BOKUM TOOLS**

Thus the original form of these boring and internal threading tools is never changed. The angle of the cutting edge and the special helical backed-off form of the front of the tool (A and B) produce a free cutting action that is constantly retained—even through resharpening.

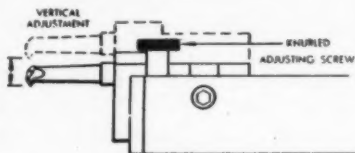
Send for folders that show complete range of sizes. Choose the tool you require and try it on your machines. See how much faster and more economical Bokum Tools perform.

H-1139 gives information on
super high speed tools and
H-398 on carbide-tipped tools



**THIS NEW HOLDER GIVES YOU
VERTICAL ADJUSTMENT**

A simple turn of knurled screw on top of holder moves tool in vertical plane to give the precision setting you want. Rocker of tool post can be left out and shims are not needed. Here is a worthy advancement in boring tool holders. Two sizes: BT-0 shank size, $\frac{3}{8}$ " x 1"; BT-1 shank size, $\frac{1}{2}$ " x $1\frac{1}{4}$ ".



Write for catalog



TRADE MARK REG. U.S. PAT. OFF.

BOKUM TOOL CO.

14775 WILDEMERE AVE. • DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

ARE YOU SANDING...

WIRE BRUSHING...

GRINDING...

POLISHING?



DO IT BETTER WITH A
SKILSANDER!

A Disc type SKILSANDER does all these jobs in a faster, easier, better way. You ought to see your distributor today about a demonstration.
DON'T JUST SAND IT... SKILSAND IT!

SKILSAND, INC., 3025 Elm Ave., Chicago 30, Ill.
Factory, Distributors and Service Centers

SKILTOOLS



Unretouched photo of Robertson Flaring Cup Cool-Cut in action in precision-tool manufacturing plant. (Name of plant on request.)

ROBERTSON *cool-cut* GRINDING WHEELS

PRECISION MADE . . . FOR PRECISION PERFORMANCE

PICK UP A Robertson Cool-Cut Grinding Wheel and examine it closely. Look at it under a magnifying glass. Note the uniform structure, the fine finish . . . sure signs of high-quality workmanship. Then, put the wheel to work.

What your eyes have told you, the finished work will confirm. With Robertson Cool-Cut Wheels you'll produce work more accurately held to size, with the desired finish, and with less effort than with any comparable wheel. Quality such as you find in Robertson wheels is not a result of hit-or-miss methods. It is the result, rather, of





painstaking care from raw materials to finished product. Even more, it is the result of Robertson's 50 years' experience in the operation of high-temperature furnaces.

Robertson's precision methods mean precision performance . . . faster and more accurately-ground work. Many users report: "Cuts grinding time in half" . . . "Production tripled" . . . "Reduces tool-grinding costs 10% to 20%." For all grinding operations—even the tough ones—you'll get top results with Robertson Cool-Cut Wheels. Send for free copy of the booklet, "How to Buy Production Time."

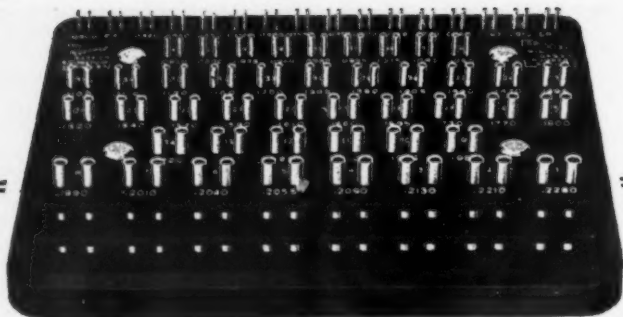
ROBERTSON

MANUFACTURING COMPANY, TRENTON 5, N. J.

Manufacturers of Vitrified Grinding Wheels • Mounted Wheels • Segments

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DRILL SIZE PIN GAGES

Class Z Accuracy

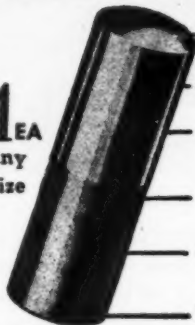
LETTER SET—52 gages in 26 pairs from A to Z. \$45 set.

FRACTION SET—60 gages in 30 pairs in steps of 1/64" from 3/64" to 1/2". \$50 set.

NUMBER SET—120 gages in 60 pairs from 1 to 60. \$90 set.

All sets include stands ... Prices F.O.B. Bridgeport, Conn.

\$1^{EA}
any
size



- Polished Radius Top
- TOLERANCE $+.0001$ $-.0000$
- Overall Length $1\frac{1}{2}$ "
- LOWER HALF CONCENTRIC
TAPERED for easy insertion
- Oil Hardened Tool Steel
- Flat Ground Bottom

Sets in pairs of gages for checking any number of similar holes. Stands have 3 plates and cover so that gages stand upright. Drill size is plainly stamped in front of each gage hole, together with decimal equivalent to the ten thousandth of an inch.

IMMEDIATE DELIVERY — 116 SIZES

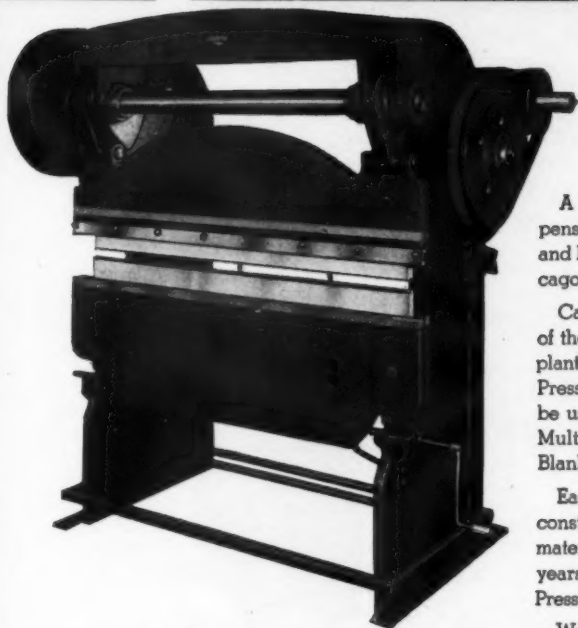
Check or M.O. should include .08c postage for quantities less than Set. Sets shipped Express Collect. No C.O.D.'s.

THE *Horberg* GAGE COMPANY

19 STAPLES STREET, BRIDGEPORT, CONN.

Powerful CHICAGO

STEEL PRESS BRAKE



TYPE "300"

A POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

Can handle 40 to 50 percent of the work done in the average plant, thereby releasing the larger Presses for heavier work. Can be used for Forming Embossing-Multiple Punching, Notching, Blanking, etc.

Easy of operation, accurate and constructed of highest quality material and backed by over 45 years experience building Steel Press Brakes and Bending Brakes.

World's largest manufacturer of Steel Hand Bending, Power Bending and Power Press Brakes.

A dependable variable speed drive much desired by all users is standard.

A Small Steel Welded Construction Press Brake a brute for punishment and a prodigious worker for the Sheet Metal Plant—

—3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by 1½ h. p. motor,

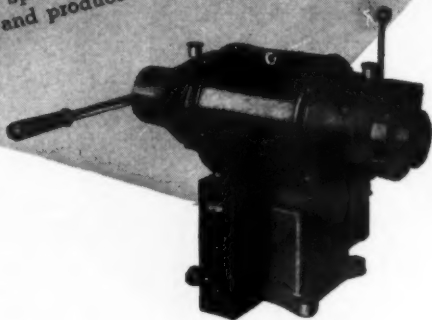
DREIS & KRUMP MANUFACTURING CO.
7440 LOOMIS BLVD. . . CHICAGO 36, ILLINOIS

SCHAUER SPEED LATHES Cut Production Cost!

Schauer Speed Lathes are today's high-production machines for polishing, de-burring, lapping, or finishing small metal or plastic parts. There is a type and size especially adapted to your finishing operations.

Write for descriptive catalog. Find out how Schauer Speed Lathes can save time, labor, money, and produce a better product for you.

Write for
Catalog 440



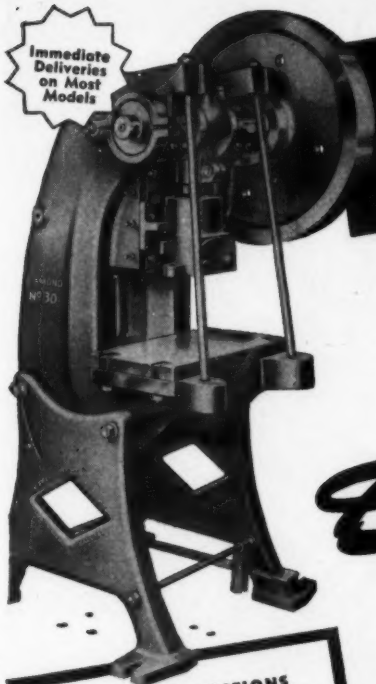
THE SCHAUER MACHINE CO.

Originators of Today's Speed Lathes

2064 Reading Road

Cincinnati 2, Ohio

Immediate
Deliveries
on Most
Models



BY ALL COMPARISON *America's Finest* PUNCH PRESSES

Streamlined, heavy duty types, inclinable for any operating position. High speed operation. Conservative capacity ratings with high overload protection. Highest quality semi-steel castings, precision workmanship. Latest designs and improvements.

Diamond

Open-back, inclinable type

9 - 14 - 30 TON MODELS

FEATURES

CRANKSHAFT—Chrome nickel steel—precision ground all over. Bearing surfaces finished to 20 micro-inches.

RAM—Bearing surfaces precision jig-ground, hand scraped for individual fit. Exclusive floating-type, fully universal ball screw and nut maintains close alignment over full ram stroke.

GIBS—Precision sliding surfaces ground to 20 micro-inches.

CLUTCH—Positive, instantaneous contact with three sets of pins engaging flywheel.

FLYWHEEL—Extra heavy for smooth operation and maximum energy. Mounted on oversize bronze bushing.

FRAME—Massively constructed semi-steel castings, correctly designed for high overload protection.

On every score **DIAMOND** punch presses are *America's finest...* on design...on workmanship...on performance

QUICK SPECIFICATIONS

Model	Standard Stroke*	Shut Dia Height	Frame Opening	Flywheel Speed
9 Ton	1½"	7"	5½"	185 max.
14 Ton	2"	9"	6½"	150 max.
30 Ton	3"	9"	10½"	125 max.

* Longer strokes available upon special order.

Write for free circulars. Dealers all over U.S.A.

DIAMOND MACHINE TOOL CO.

DEPT. B, 3429 OLYMPIC BLVD. • LOS ANGELES, CALIF.

Manufacturers of the **DIAMOND** Line of Precision Machine Tools and Accessories

DIAMOND

DTCO

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DESIGN FIXTURE CLAMPS WITH THESE STANDARD SIEWEK DETAILS AND ACCESSORIES



- Clamp Rest
- Rest Button
- C Washer

- Collar Nut
- Hand Knob
- Double Cam

- Single Cam
- Fixture Key
- Standard Cam

- Hand Wheels
- Quarter Turn Screws
- Spherical Washers

Manufacturers of

SIEWEK

*Picture Clamps
and Fittings*

FREE!

Full size
Template Trac-
ing Sheets on
request.



Save designing and tool room time by using standard Siewek parts—*immediately available from stock*—in building special fixture clamps. These units are readily adaptable ... and have many applications. You can buy them for less than the cost of designing. Rebuild broken clamps by incorporating Siewek parts as replacements. *Write today for prices!*

SIEWEK TOOL COMPANY

2062 West Grand Boulevard

Detroit 2, Michigan

Distributors in Principal Cities



PULL

A SOCKET MUST HAVE

TO BEAR THE NAME *New Britain*

The complete New Britain Line for Automotive, Aircraft, General Maintenance and Production Needs is sold by leading Jobbers.

Greater Strength and Better Fit . . . that's what New Britain guarantees in every Socket that bears this famous signature.

Only the finest alloy steel can meet the rigid requirements of New Britain . . . to give amazing pulling power for least bulk. Only precision machining and broaching can hold tolerances so close as in these Sockets . . . to give unequalled "sweet fit on the nut." And, heat-treatment must be expert to boost strength to such high, super-safe limits . . . to give that extra toughness that stands up under hard use.

No slips or sudden breaks here . . . just downright knuckle and job insurance. That's why New Britain Sockets and Drive Parts have so much **PULL** with plant maintenance and repairmen. Ask your Mill Supply Jobber to show you these time-saving, money-making Hand Tools today. The New Britain Machine Co., New Britain, Conn.

New Britain

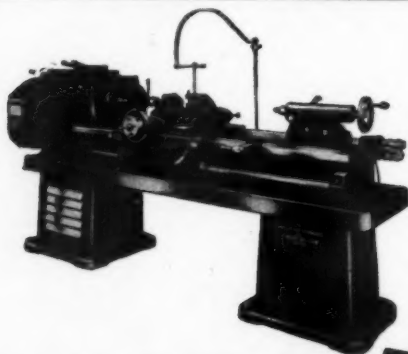
GREATER STRENGTH • BETTER FIT

HAND TOOLS

When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

40 YEARS of EXPERIENCE

produced
the new **COULTER**
AUTOMATIC THREADING LATHE



The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

Equipped with disc clutch . . . Easy to operate . . . Rigid Construction . . . Four speed headstock . . . Return or Idle travel speed has been increased five times cutting speed.

PRODUCTION MACHINES
SINCE 1896

Write for full particulars

The James **COULTER** *Machine Co.*

BRIDGEPORT

• CONNECTICUT •

U. S. A.

BILLINGS *Sockets*



DEEP WALL



UNIVERSAL



REGULAR

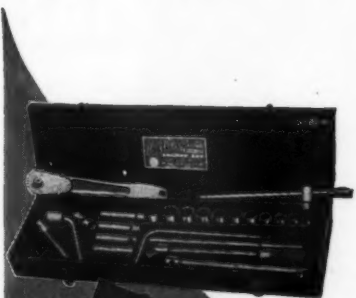
HOT FORGED

. . . from selected steel.

Thin walls and strong, too!

$\frac{3}{8}$ " - $\frac{1}{2}$ " - $\frac{3}{4}$ " Square Drive

SEE YOUR MILL SUPPLY
OR HARDWARE DEALER

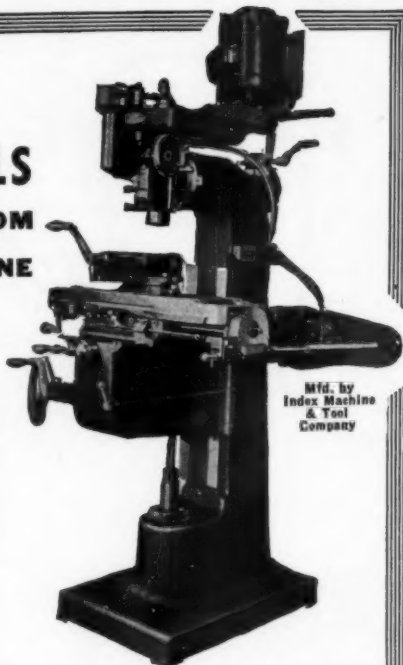


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INDEX VERTICAL MILLS FOR THE TOOL ROOM OR PRODUCTION LINE

For use with end mills $\frac{1}{8}$ " to 1" in steel. Equipped with verniers, as standard equipment in addition to micrometer dials on table actuating screws for locating. Further accuracy available with rods and indicators which can be furnished as extra equipment.

If you want speed and precision on milling, drilling and boring send for a catalog on Index Mills.



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A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

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Index Mills participated in all important war production programs from camera and guns to atomic bombs. Ask any owner how they like their Index Mill.

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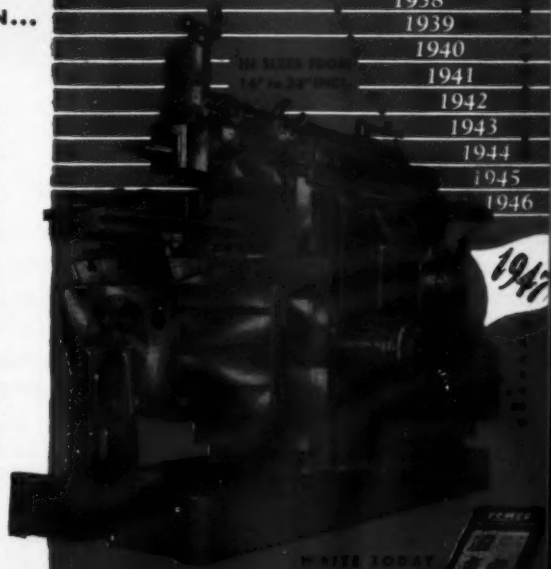
All three models of GEMCO Multi-Purpose Shapers...Plain, Production, and Universal types...incorporate important features in design that have been proved by 30 years of research, proved by actual tests in countless machine shops or suggested by operators from all parts of the country. These superiorities, resulting from the composite thinking of men who know, make GEMCO Shapers first for high performance, wide adaptability, maximum economy and lower production costs...and increased profits. Featuring in addition, GEMCO'S own exclusive LUBRIGARD, the safety device that prevents damage to the machine through any failure in the lubricating system, GEMCO Shapers give longer, trouble-free service. Complete and detailed description of the features found only in GEMCO Shapers are set forth in the Bulletins that are free to you for the asking.

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IT'S EASY TO GRIND

*Radial form
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Any good grinder
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Use the COMBINATION DRILL TABLE and VISE



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Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

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We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.



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Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.
Jackson, Michigan

CLEAN AIR



SMOOTH

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Get All Three

from one compact assembly—the Norgren Lubro-Control Unit. Assures higher production and longer life from tools and cylinders.

Filter **CLEANS** the air, knocks out solids, moisture and oil emulsion. Regulator **MAINTAINS** air-power at right pressure for maximum performance. Lubricator **OILS** the air that drives the tool or cylinder. Protects against wear while equipment operates; against rust and corrosion while tool is idle. Filter, regulator, or, lubricator available separately or in any combination.

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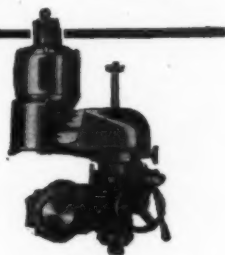
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PRECISION RAM TYPE

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**VERTICAL UNIVERSAL
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- Flexible
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DANLY PRECISION DOWEL PINS are accurate through their entire length . . . Diamond tested for hardness (58-60 Rockwell-C) . . . Ground to a tolerance of .0001".



DANLY KNURLED SOCKET-HEAD CAP SCREWS save time and money. The mechanic can drive the knurled head a good part of the way before using the wrench. Infinite applications — a wide range of sizes.



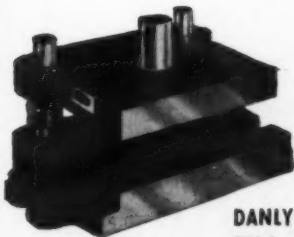
DANLY KWIK-KLAMP TOGGLE CLAMPS combine strong construction and simplicity of operation — used wherever quick, positive clamping action is required.



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RELEASING MODEL
FOR HAND SCREW MACHINES
AND TURRET LATHES

ALCO TAP HOLDERS
Help Tool Conservation



Don't just take it for granted that tap breakage is a necessary evil. If you use ALCO Tap Holders you can reduce your breakage to a minimum and at the same time increase production and reduce set-up time.

No all out effort can be made to reach top production from your taps unless the tap and the hole are in perfect alignment. ALCO Tap Holders accomplish this absolute concentricity through the application of the patented floating feature of this precision built tool.

You won't need bushings and you can deliver more perfectly threaded pieces for the assembly room.

Send for new catalog No. 4.

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You get these *extra* features in the **JOHNSON** METAL CUT-OFF BAND SAW

***extra* CAPACITY** — 10" high, 18" wide — The added inch or two that can save so much trouble on the occasional extra large job. Takes heavy bars, tubes, angles, flats, gang cutting on small stock.

***extra* STABILITY** — because of the three-point support — no wobble, no twisting strain on bed. Uneven floors don't matter with the Johnson. Move it anywhere you like — castors optional.

***extra* ACCURACY** — because of the unusual stiffness of the machine, and wide guide rolls rigidly held. Cuts square and smooth, and close as you like to finished dimensions. Saves metal and machining time.

***extra* LONG BLADE LIFE** — because the extra large band wheel causes very little twist of blade, and the extreme rigidity of the machine prevents unusual strains on the saw.

Here is a machine that looks as modern as it is — substantial, stream-lined, stable, with that finer finish, greater weight, greater refinement of control, greater dimension of bearings all round, greater convenience of operation, which means it will do more and better work in any shop, all at little or no more first cost. Available with wet cutting attachment if desired. Bulletin on request.

***extra* CONVENIENCE,**

too — faster vise operation, all controls in reach of operator, fine, hydraulically controlled feed adjustment, four speeds, quick-operating stock stop for duplicate work, automatic motor shut-off at end of cut.



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Beat the dust problem
in your plant simply
and economically with



TORIT **DUST COLLECTORS**

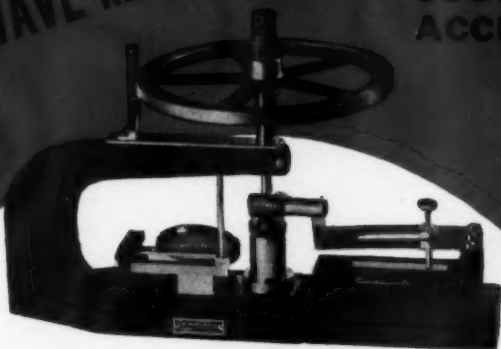
Running only when the machine is operating, TORIT Dust Collectors collect abrasive dusts at their source. They eliminate extensive piping and recirculate the cleaned air back into the room.

TORIT Dust Collectors range in size from $\frac{1}{3}$ to 3 HP. Compact and portable they fit all grinding, polishing and cut-off machines, and all production layouts. For complete information and the latest TORIT catalog write:

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Van Keuren LIGHT WAVE MICROMETER

for
**SUSTAINED
ACCURACY**



NEW SYSTEM OF ACCURACY—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

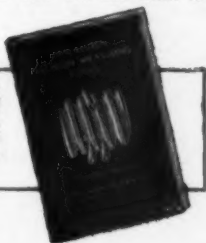
A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carbide wearing surfaces make the instrument accurate and dependable for years of constant service.

CONTROLLED PRESSURE ASSURES UNIFORMITY—By using the sensitivity of light waves the light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

IDEAL FOR SHOP MEASUREMENTS—The light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the light wave micrometer. It is fast, accurate and profitable.

The Van Keuren light wave micrometer is described in catalog No. 33. This book also gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears.

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks •
Vee-Insert Plug Gages • Wire Type Plug Gages • Measuring Wire •
Thread Measuring Wires • Gear Measuring System • Shop Standards •
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Heft plus



Plus cutters set at an angle to give an extra shearing effect (as well as picking action of the Huntington-type cutters). This *Heavy Duty Dresser*, an exclusive patented Desmond design, is fastest and best for high-speed,

specially bonded wheels. Cutter spindle mounted in dust-protected ball bearings, a *must* for this type of service. Cutters replaced quickly without bearing adjustments. Buy from your mill supply distributor. Write for complete catalog.

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Desmond

the only complete line of grinding wheel
DRESSERS & CUTTERS



**BALL BEARING
DRESSERS**



**REVOLVING
CUTTER TYPE DRESSERS**



**DIAMOND HAND TOOLS
AND NIBS**



**WHEEL TYPE
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**SIMPLEX
STEEL-SLIDE VISES**

FAST-VERSATILE

Easy on the Budget

It almost has a "brain for drilling"! The husky, accurate "Buffalo" RPMster enables you to go from job to job **without even hesitating** for speed changes. By touching a lever, you can adjust to desired speed instantaneously. It's big—99" high—yet easy to operate.

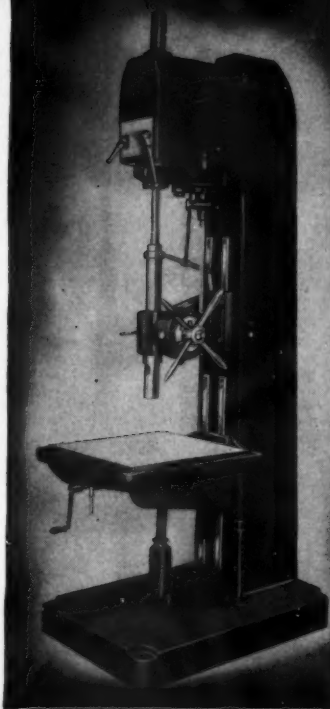
You can only appreciate the cost-cutting speed of the RPMster by actually operating one. Why not get in touch with us for all the facts . . . and see how an RPMster can handle your drilling and tapping jobs at remarkably low cost!

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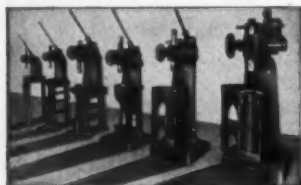
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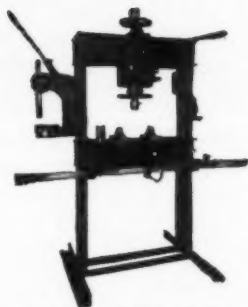
DAKE is the name to remember when ordering arbor presses.

All Dake Arbor Presses are built to quality standards. Every Dake Arbor Press is made with square ram for longer life... each press has the extra weight, scientific bracing, machined table, and accurate balancing that have made Dake models so popular.

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Dake 50-ton hydraulic press with extras. A rugged, powerful press for heavy-duty work.

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Please mail me a copy of the latest Dake Arbor Press Catalog.

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For fast, efficient rough grinding and fine finishing of carbides, stellite, high speed steel, and other modern tools, install Prosser Carbide Grinders. Their rugged construction, modern design, and ease of operation insure long, dependable and profitable service.

Prosser Carbide Grinders are built in bench and floor models of several capacities, for wet or dry grinding. Attachments for chip breaker and drill grinding.

Important features include:

- Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High grade ball bearing spindles.
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- Moderate price.
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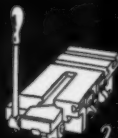
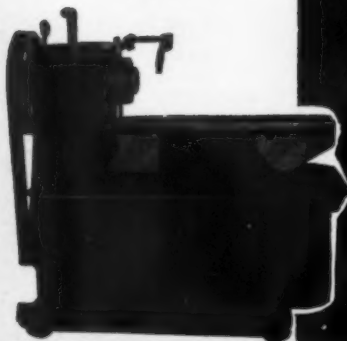
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Start with
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1 CROSS-SLIDE
Hand screw feed.



2 CROSS SLIDE
Rack and pinion feed.



3 CARRIAGE
With manual or power
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4 TURRET:
6 station flat type, with
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Many other standard or
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"BASIC UNIT + PARTS" PLAN of the MINNEAPOLIS PRODUCTION LATHE

Do ceiling prices and high labor costs make your production costs a problem? You can save on both first cost and operating cost with the Minneapolis Production Lathe, which is easily handled by inexperienced help. Under our plan, you order only the equipment needed for your particular job. 14" swing, heavy duty spindle assembly. 2 1/4" round bar capacity. Send sample part or drawing, and we'll quote you on a Minneapolis lathe "tailor made" for your work.

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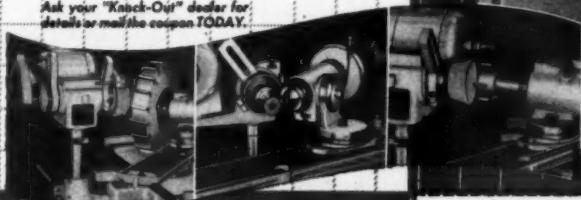


WHEN YOU USE A "KNOCK-OUT" Universal Cutter Grinder

Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lost between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A "Knock-Out" Universal Cutter Grinder is the busiest machine in any Tool Room.

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1119 First Ave. S. E., Aberdeen, S. D.

Please send us complete details on
"Knock-Out" Universal Cutter Grinders.

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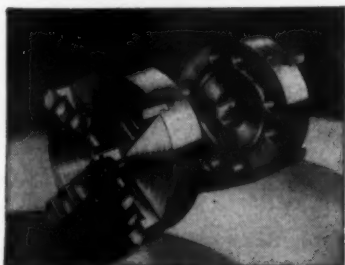
SKINNER CHUCK CO., 340 CHURCH ST., NEW BRITAIN, CONN.

Chuck NEWS

DESIGNED FOR HEAVY PRECISION WORK

**Skinner Steel Body Independent
Chucks in Models to Suit Every
Spindle Nose**

New Britain, Conn.—Series 1900 Independent Chucks are especially designed for use on engine and tool room lathes handling heavy precision work. These chucks are proven producers throughout the nation in manufacturing plants and railroad shops. They have such features as rugged, balanced, forged steel bodies capable of withstanding the severest jaw pressures, solid, serrated jaws that can be used for gripping either internally or externally, and large, hardened steel thrust bearings to take the end thrust imposed on the operating screws. And, because independent chucks are so versatile, the Skinner 1900 Series is built in a wide variety of models designed for direct mount-



Skinner Series 1900 Independent Chuck

ing on various types of spindle noses. The 1900-D and 21900-D are for use with cam lock type D-1 spindle noses; the 1900-L and 21900-L for long taper key drive type L spindles; Models 1900-A, 21900-A and 29900-A for direct mounting on American Standard Type A-1, A-2, B-1, B-2 flanged spindle noses. For mounting on lathes with threaded spindle noses by means of intermediate adaptor plates, Skinner makes two models—the 1900 and 21900. A further advantage of Skinner Steel Body Independent Chucks is that they are available for early delivery. Complete information on all of these Chucks is contained in Catalog No. 59—write for it today.

**HAND & POWER OPERATED MACHINE CHUCKS—AIR CHUCK EQUIPMENT
—FACE PLATE JAWS—MACHINE VISES**

**Look to MODERN for accurate,
fast, economical thread cutting**

Hardened and ground throughout

Easily adjusted for thread size

Wider threading range

Greater flexibility

*Made with least
number of parts*

Quick and easy chaser change

*Cut close-to-shoulder threads
without special chasers*

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

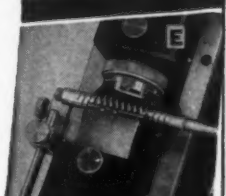
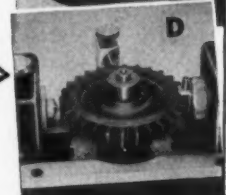
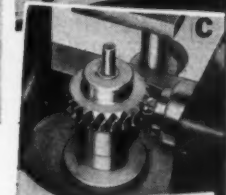
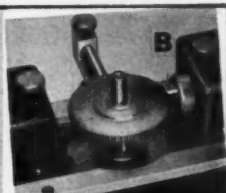
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SOLID ADJUSTABLE
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Modern Self-Opening Die Heads thread diameters from $\frac{1}{8}$ " to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

*For complete information,
write for Bulletin No. M-123*

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DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK



THE REVOLUTIONARY
ORLANDI ★
GEAR CHECKER

FAST — ACCURATE — SIMPLE
CHECKS SPUR & HELICAL GEARS
WITH PINS & BALLS

Production
& Precision!

**HERE'S WHAT
 IT CHECKS**

1. P. D. of spur and helical gears (A)
2. Concentricity without master (B)
3. Concentricity and sizes of worm gear with ball (C)
4. Tooth spacing (D)
5. Backlash (D)
6. Parallelism
7. P. D. of any thread form with 3 wires (E)
8. Diameter of gear and worm blanks
9. Plug gages, arbors, etc., as a comparator

It's easy to convert the
 Orlandi to check P. D.
 with 3 wires

ORLANDI ★
GEAR & MACHINE CO.
16195 MEYERS ROAD
DETROIT 27, MICH.

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ACRO DIE SET PULLERS



The principle of the Acro Die Set Puller is to remove the punch holder from die shoe by a simple upward pull, whereas punch holder travels upward from die shoe entirely, leaving both leader pins simultaneously. This can be accomplished only by use of the patented screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented by Acro feature, found only on Acro Die Set Pullers.

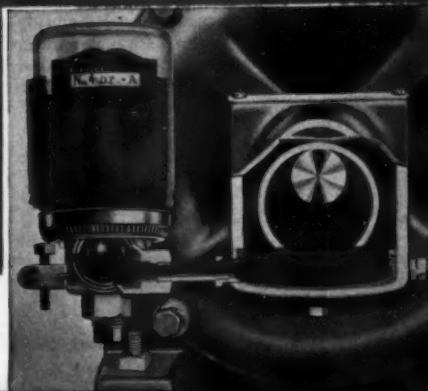
Order a set today. Convince yourself of the savings you can make in your tool room. ACRO PULLERS furnished in three sizes. Write now for more information.

Dead visibility — Sight glass on side of lubricator bowl an exclusive SUPER feature, shows exact oil level maintained in bearing plus oil supply in reservoir, eliminating guess work.

There is no dripping, no waste, no over flow. Oil is automatically led to the bearing as required.

Nationally known authorities estimate that 75 per cent of all machinery repairs are caused by inefficient and improper lubrication, and that 25 per cent of the oil bought for lubricating purposes is never used by the bearing surface for which it was intended. WRITE FOR LITERATURE.

SUPER LUBRICATOR . . .



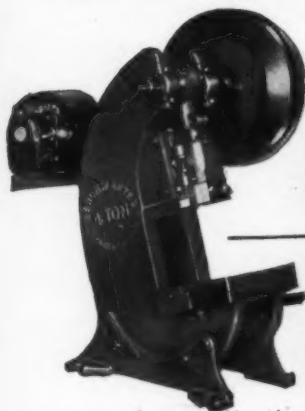
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**PROMPT
DELIVERY**

METAL STAMPING COMPANY. 332 E. RESERVOIR AVENUE
MILWAUKEE 12, WISCONSIN

Benchmaster's^{*} Improved Model

4-TON CAPACITY BENCH PUNCH PRESS



^{*} World's largest manufacturer of small presses.

Small in Size

MIGHTY in Performance

FOR STAMPING, MARKING, PUNCHING, RIVETING, FORMING AND OTHER HIGH-SPEED OPERATIONS

Light, compact and powerful, the improved, postwar Benchmaster 4-Ton Capacity Punch Press offers performance formerly found only in far larger models. Its unusual and exclusive features include a cradle base that allows the press to be inclined, a precision-ground shaft keyed by a press fit to a large eccentric to provide shock-absorbing bearing surface, bronze bushings at all wear points, a single trip action that may be made to repeat rapidly by removing a screw located in the collar, automatic knockout, an open back so that work may also be inserted from the front, a new-type floating motor mount which maintains proper tension of the V-belt, standardization of parts for quick, easy interchangeability and many other typical Benchmaster improvements.

For full information about this new Benchmaster Punch Press and other quality Benchmaster machine tools, write to Dept. MT-4

SPECIFICATIONS:

Weight, 215 lbs.
Height, 27"
Die space, 5 $\frac{1}{4}$ "
Center of bolster plate
to frame, 3 $\frac{3}{4}$ "
Bolster plate, 6" x 8" x 1"
with 2" hole in center
285 strokes per minute with
1725 R.P.M. electric motor
1" stroke standard
Other strokes up to 2"
special

benchmaster

MANUFACTURING COMPANY
2952 WEST PICO BOULEVARD
LOS ANGELES 6, CALIFORNIA





Actually There's NO TRICK to Reducing Milling Costs!

Your milling costs can be cut to a minimum by using Kempsmith Standard Attachments to increase the productiveness of your standard milling machines.

57 years of specialized experience has given Kempsmith the necessary "know-how" to turn out dependable, precision-built Attach-

ments, Arbors and Accessories.

Kempsmith Standard Attachments are made to perform the most delicate milling operations with both speed and accuracy. Why not investigate the cost-saving possibilities of these sturdy, time-proven tools? Write, today, for literature.

KEMPSMITH MACHINE CO. • MILWAUKEE 14, WIS., U.S.A.

KEMPSMITH

Precision Built Milling Machines Since 1888

The JIG BORER that inspects its own work

In the Moore Jig Borer you can re-check hole locations after boring, within a "tenth" and without gage blocks, while the work is still in the machine.

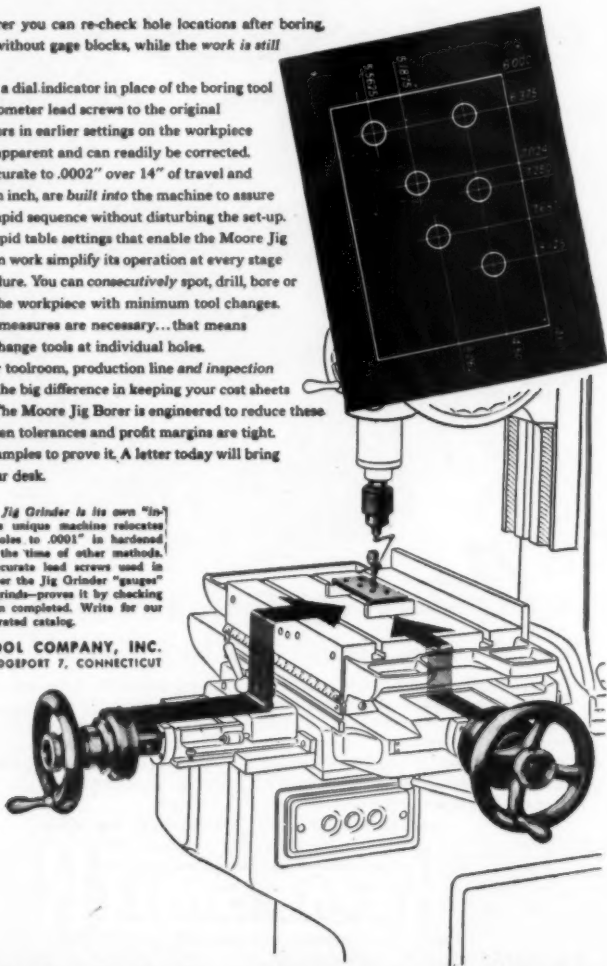
By simply inserting a dial indicator in place of the boring tool and resetting the micrometer lead screws to the original specifications, any errors in earlier settings on the workpiece become immediately apparent and can readily be corrected. Moore lead screws, accurate to .0002" over 14" of travel and to .00005" in any given inch, are built into the machine to assure precise inspection in rapid sequence without disturbing the set-up.

The accurate and rapid table settings that enable the Moore Jig Borer to inspect its own work simplify its operation at every stage of the jig boring procedure. You can consecutively spot, drill, bore or ream all the holes in the workpiece with minimum tool changes. No size blocks or end measures are necessary...that means less stop-and-start to change tools at individual holes.

Saving hours in your toolroom, production line and inspection department can make the big difference in keeping your cost sheets at competitive levels. The Moore Jig Borer is engineered to reduce these all-important hours when tolerances and profit margins are tight. We have many case examples to prove it. A letter today will bring complete details to your desk.

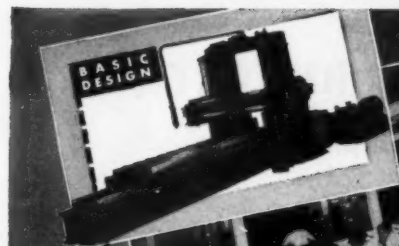
P. S. The Moore Jig Grinder is its own "inspector", too. This unique machine relocates and finish-grinds holes to .0001" in hardened parts in one-third the time of other methods. With the same accurate lead screws used in the Moore Jig Borer the Jig Grinder "gauges" its accuracy as it grinds—proves it by checking its own work when completed. Write for our new 28 page illustrated catalog.

MOORE SPECIAL TOOL COMPANY, INC.
728 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT



MOORE JIG BORER

SPOTS, DRILLS, BORES, REAMS...WITH MINIMUM TOOL CHANGES



4014

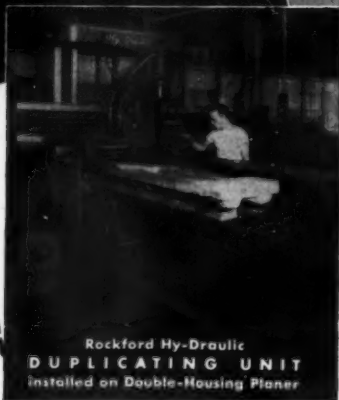


A Hard-to-Beat Formula For Better Machines

Whether the machine you need is a Rockford Double-Housing Planer, as shown here, or a shaper or slotter . . . Rockford Hy-Draulic design will give you an important advantage. This advantage is adaptability. Because of Hy-Draulic design, our engineering department can take any Rockford machine, add whatever accessories or extra equipment you require, and give you a machine to meet exactly your overall job specifications. Each machine type is available in a wide range of sizes and stroke lengths.

Basic Rockford Hy-Draulic Planer, Shaper, or Slotter design processed through Engineering to meet your particular needs is a hard-to-beat formula for a better machine. For information on Rockford Hy-Draulic Machine Tools, write for Catalog 1946.

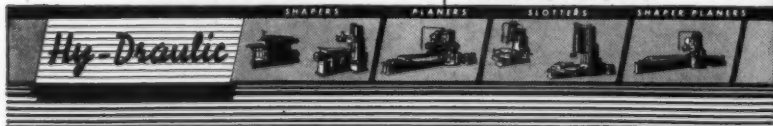
ROCKFORD MACHINE TOOL CO.
ROCKFORD, ILLINOIS



Rockford Hy-Draulic
DUPLICATING UNIT
Installed on Double-Housing Planer

Installed on any Rockford Hy-Draulic Machine, the Duplicating Unit simplifies many types of metalworking jobs. Typical application is shown here.

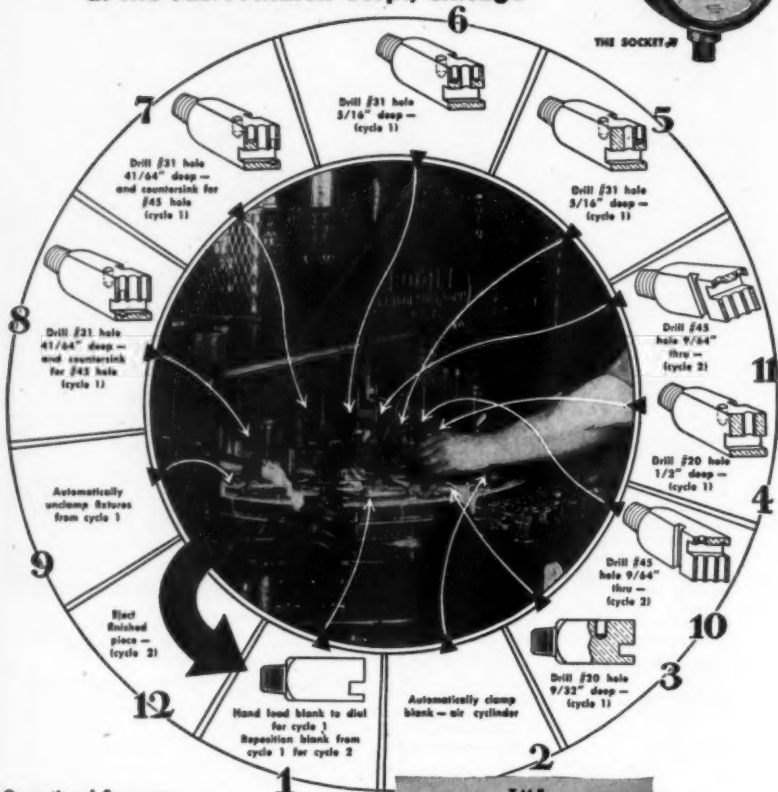
The tracer of the duplicating unit travels over the pattern and controls the position of the tool head; whatever contour exists on the pattern is duplicated on the die block. The Rockford Duplicating Unit is hydraulically operated throughout. Tracer pressure can be adjusted for so light a pattern contact, that low-cost plaster pattern is practical. Write for complete information on Rockford Hy-Draulic Duplicating Unit.



When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

Bodine...CASE HISTORY No. 19

Processing a Brass Gauge Socket
at the Jas. P. Marsh Corp., Chicago

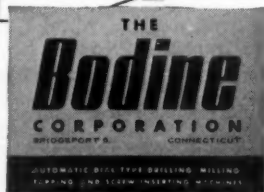


Operational Sequence:

This Bodine set-up employs 8 spindles. The part is repositioned in the dial for a second pass (cycle 2) under the spindles to complete all operations.

Production:

One piece is completed per stroke of the machine, 700 pieces per 50 minute hour . . . a total of 5600 operations. Maybe YOU can use a Bodine to reduce production costs.





CUTS DRILLING COST 20%

THIS machinery manufacturer was using slow-speed, 15-lb. piston type tools to drill $\frac{1}{8}$ " to $\frac{1}{4}$ " holes. The Rotor Application Engineer recommended 1000 R.P.M., 9-lb. Rotor Air Drills. Results:

Saves 20%. Faster, easier drilling increased production 25% . . . cut costs 20%.

Reduces Maintenance. Rotor Air Drills cut upkeep

to fraction of former cost. No pistons, toggles, etc. to wear.

Cuts Fatigue. Drilling and reaming in all positions simplified by saving of 6 lbs. in weight of tool.

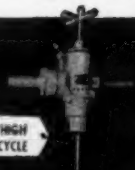
Try the Rotor Application Engineer's diagnosis for your cost ills.

AIR O'TOOL

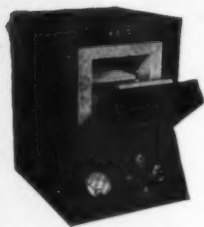
ROTOR TOOL



AIR



HIGH
CYCLE



LUCIFER

ELECTRIC HEAT TREATING FURNACES

WITH AUTOMATIC HEAT CONTROL

Just what you have been waiting for. Electric heat treating furnaces that are easily operated; you can do your own heat treating — harden and temper dies, punches, gauges, jig and fixture parts, normalize weldings and castings. It's easy with a "LUCIFER" because it has the "LUCIFER" automatic electric heat control that permits stepless control of any predetermined heat within its range up to 2000° F. All "LUCIFER" furnaces are equipped with indicating built in pyrometers calibrated both in Fahrenheit and Centigrade, pilot light, control switches and automatic control devices. You can now equip your old Furnace with a Lucifer Automatic Heat Control unit 115 or 230 V. A.C. up to 5 K.W., from \$27.50 to \$41.50 complete. We can also supply a 7 day Control, which will turn your furnace on in the morning and off at night, shut off at noon Saturday, skip Sunday and repeat each 7 days. \$27.50 complete. All prices are F.O.B. factory Philadelphia, Pa.

SPECIFICATIONS

- Interior size—Model 7051—5½"x5½"x6"
- Exterior size—15"x15"x17"
- Operation—115 V. A.C. only
- Rating—1.2 K. W.
- Ship. Wt.—Approx. 85 lbs.
- Operating cost—Approx. 3c per hr.

PRICE \$112.00 f.o.b. Factory, Philadelphia

SPECIFICATIONS

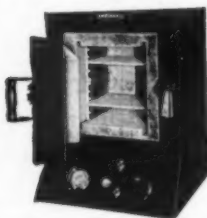
- Interior size—Model 7053—8"x8"x10"
- Exterior size—18"x20"x24"
- Operation—115 V. A.C. or 230 V. A.C.
- Rating—3 K.W.
- Ship. Wt.—Approx. 225 lbs.
- Operating cost—Approx. 6 to 8c per hr.

PRICE \$188.00 f.o.b. Factory, Philadelphia

SPECIFICATIONS

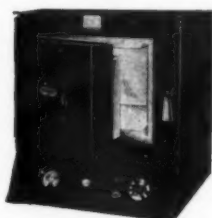
- Interior size—Model 7052—12"x12"x10"
- Exterior size—22"x22"x24"
- Operation—230 V. A.C.
- Rating—4.8 K. W.
- Ship. Wt.—Approx. 350 lbs.
- Operating cost—Approx. 10 to 14c per hr.

PRICE \$260.00, f.o.b. Factory, Philadelphia



DEALERS:

Write for our interesting offer to qualified distributors. Desirable territories open.



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Donahue Steel Products Co.
74th St. & Damen Ave.
Cleveland, Ohio
Moslo Machinery Co.
2443 Prospect Ave.

Omaha, Nebr.
Fuchs Machinery Co.
Jackson at 15th St.

Huntington Park, Calif.
Reagan Company
6409 Santa Fe Ave.
Milwaukee, Wis.
Curt Loeser
4213 N. Newhall St.

Minneapolis, Minn.
The Satterlee Co.
118 Washington Ave. North
New York
Lafayette Tool & Supply Co.
128 Lafayette St.

Providence, R. I.
H. Leach Machinery Co.
387 Charles St.

SOLE SELLING AGENT . . .

GILBERT S. SIMONSKI
401 N. BROAD ST., PHILADELPHIA 8, PA.



Here's why
Workmen like

WELLS

METAL CUTTING BAND SAWS



The No. 8 showing new Wells Wet Cutting System--an economical accessory available for all No. 8 Wells Saws.

Specifications

CAPACITY:

Rectangular 8" x 16"

(Special Guides) 5" x 24"

ROUNDS: 8" diameter

MOTOR: ½ H.P., A.C. or D.C.

SPEEDS:

Selective 60, 90, 120 feet per minute

WEIGHT: Approximately 445 lbs.

You don't have to go through a lot of motions when you use a Wells Saw. Just place the material in position for cutting, give a turn to the hand wheel of the quick-acting vise, and you're ready to go. Hydraulic stabilizer on gravity feed and automatic shut-off take care of the rest. *No wonder the Wells is popular with users!*

From a management standpoint, it pays to provide workmen with these modern, efficient, versatile tools. Use them in stock rooms, machine shops, on maintenance jobs. Wells Saws do good work, cut close, remove minimum material. For production work, your Wells Saw can be equipped with the new Wells Wet Cutting System. Ask for complete information. See your local Wells representative or write.

Wells.com
the way to better shops

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
707 COOLIDGE AVENUE, THREE RIVERS, MICHIGAN

OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED • OIL-FILLED

FOR BETTER INDUSTRIAL SHARPENING



BENCH STONES

BY **NORTON ABRASIVES**

Oilstones are supposed to be used with oil. Oil makes them cut faster and cooler and produces a better cutting edge. Oil helps them resist glazing and filling.

But oil-filling is a messy job at best — and it has to be done right. The oil must penetrate the pores of the entire stone. And, unless the right kind of oil is used, the surface of the stone will "gum."

Factory oil-filling is just another little extra quality feature of Crystolon and India Bench Stones. The whole job is neatly done at the Norton-Pike factory so these famous stones are oil-filled when you get them.

Specify Crystolon for silicon carbide abrasive, or India for aluminum oxide — they're both oil-filled for your convenience — and for better sharpening. Write for your copy of "How to Sharpen."



BEHR-MANNING • TROY, N. Y.

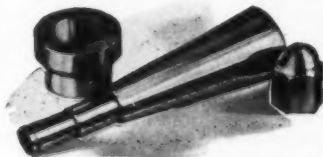
(DIVISION OF NORTON COMPANY)

ALSO QUALITY COATED ABRASIVES SINCE 1872

JOB SHOP STANDARDIZES ON...



GREENLEE MULTIPLE-SPINDLE AUTOMATICS



TYPICAL PARTS PRODUCED

- (A) Steel Pipe Fitting from 1½" round, 47½
430 S. S. rod. Time: 31 sec. per piece.
(B) Tapered Steel Roller from 1½" round, SAE 4620
stock. Time: 55 sec. per piece.
(C) Hex nut ¾" from B1113 stock. Time: 8½ sec. per
piece (Dual set-up).



GREENLEE BROS. & CO.
1834 MASON AVE.
ROCKFORD, ILLINOIS



SMALL LOTS HANDLED PROFITABLY BY SCREW MACHINE PRODUCTS CO.

Here is more evidence indicating the unusual adaptability of Greenlee Automatics for handling short run screw machine jobs. At Screw Machine Products Co., Milwaukee, 50% of the work produced in 1946 by this battery of 4- and 6-spindle Greenlees consisted of runs between 1,000 and 10,000 pieces. Stock sizes ranged from ¼" to 2¾" in diameter. Quick change-overs in set-ups and economical tooling were a "must" in meeting competitive market conditions. The experience of this company with the savings made by Greenlee Automatics dates back to 1939 when a 16 6-spindle machine was installed. Today, the 16 Greenlees in a standardized set-up handle a thriving job shop business.

WRITE FOR MORE FACTS — SEE MOVIE

Send for a copy of 20-page book explaining timesaving and cost-saving features of Greenlee Automatics. Ask to see new 40-minute sound movie showing the building of a Greenlee "G" from foundry to finished machine.

MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

When Writing Advertisers Please Mention **MACHINE** and **TOOL BLUE BOOK**

ALL THESE TOOLS - and others too - are MOST PROFITABLY SHARPENED on **BLAKE TAP GRINDERS**

because you can sharpen—

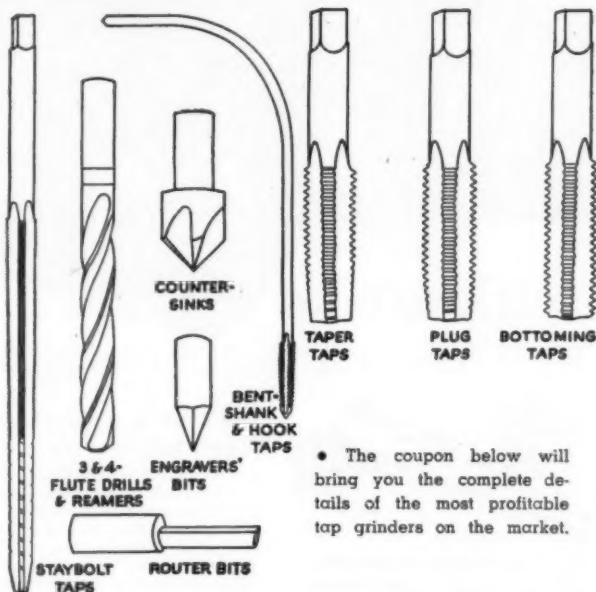
a GREATER
variety ...

a GREATER
quantity ...

a GREATER
number of
times ...

in LESS
minutes ...

with LESS
skilled
labor ...



• The coupon below will bring you the complete details of the most profitable tap grinders on the market.

Please send me Bulletin 544 which gives complete details on Blake Tap Grinders. H.

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

EDWARD BLAKE CO.
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

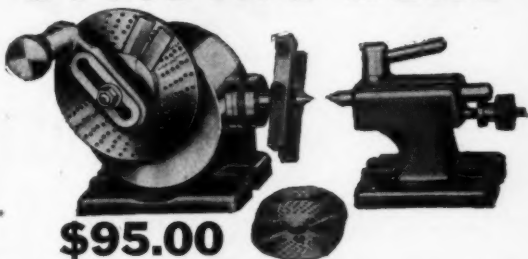


ANNOUNCING THE NEW L-W Model SD 6-1/2" UNIVERSAL DIVIDING HEAD

Well built for hard daily usage on smaller milling machines. Rugged head and tailstock.

Alloy steel spindle has a tapered bearing. Bored for No. 9 B & S taper threaded spindle nose. Head tilts to 90° ± in vertical position. Special alloy steel worm and bronze worm wheel cut to close limits for accuracy. End thrust is taken out by bronze bearings.

Complete with three index plates for dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart shows all divisions obtainable to 360.



\$95.00

L-W 11" UNIVERSAL DIVIDING HEADS

Headstock — Rugged. Rigid. Swivels to any angle.

Tailstock — Sturdy. Withstands heavy cutting.

Headstock Spindle — Tapered bearings, bored for No. 10 B & S Taper, increased diameter and length. Threaded spindle nose, 2 1/4" diameter 10 thread USS.

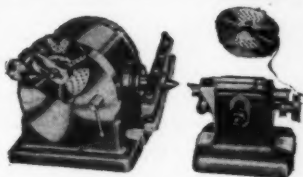
Worm — Special alloy steel, accurately finished ball bearing and thrust. Easy, accurate adjustment of worm wheel.

Worm Wheel — Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

Equipment — 3/4" table slot tongues, three index plates, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart shows all divisions obtainable to 360.

When ordering AU Heads specify either right or left hand model.

**Model BP for
Plain Milling
Machines
\$151.20**



**Model AU Fully
Universal for
Complete
Indexing and
Spiral Cutting
\$219.15**



Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



DYNAMOMETERS



MAGNETIC CHUCKS



DIVIDING HEADS



RECTIFIERS



DEMAGNETIZING SWITCHES



LATHE CHUCKS



UNIVERSAL CHUCKS

POWER HAIR TAMS



MILLING MACHINES

L-W CHUCK COMPANY

23 SO. ST. CLAIR ST.
TOLEDO 4, OHIO

AIR CYLINDER?

Yes Sir—A

FENN CUSTOM-BUILT AIR CYLINDER

No longer do machine designers and production men have to fit their machines and jigs to standard air cylinders.

FENN Custom-Built Air Cylinders are made to provide accurate control of the piston velocity curve according to the specific need. They can be cushioned at either or both ends of the stroke. They will deliver the same or greater power from the available air pressure that standard cylinders will, but at great savings of space and with valuable air economy. Valves can be integral; valve values extreme.

Prices naturally are somewhat higher than prices of standard air cylinders. Orders in any quantity are invited.

SPECIFICATIONS

O.D. 1 1/16"

STROKE 42"

SPEED 60CY/MIN

VALVE INTEGRAL

The **FENN** *Manufacturing Company*

HARTFORD • CONNECTICUT

DEPARTMENT G

HERE'S SOMETHING NEW IN TOOL KITS
TO SAVE YOU *Minutes AND Money!*



duMONT'S *Minute Man* KEYWAY BROACH KIT

Think how often you have keyways to cut in gears, milling cutters, pulley hubs, collars, couplings, etc.

With this *Minute Man* Set you can cut any standard width, any depth keyway in *one minute!* You simply select the right bushing for the bore, insert the broach in the bushing slot, place it under the arbor press and press it through, using a shim and second pass to get the exact depth desired. It's done in a tiny fraction of the time it would take to set up a machine for the job. Broaches, shims, bushings, keyway stock are all right there in the set.

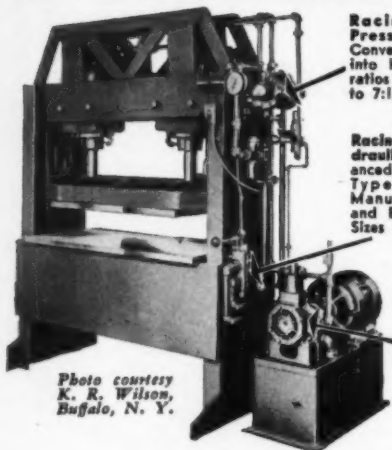
Minute Man Keyway Broaches and Kits are sold only through Mill Supply Distributors.

Let us mail you the name of the nearest distributor together with our new Catalog "T" containing complete information and prices on all sizes of Broaches and Kits and a lot of valuable reference information.

The du MONT
CORPORATION

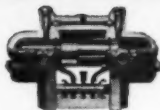
GREENFIELD, MASSACHUSETTS

RACINE HYDRAULICS



*Photo courtesy
K. R. Wilson,
Buffalo, N. Y.*

Racine Hydraulic Pressure Booster — Converts low pressures into high pressures in ratios ranging from 3:1 to 7:1.



Racine Four-Way Hydraulic Valve — Balanced Piston — Sleeve Type construction. Manual, Mechanical and Electrical control. Sizes $\frac{3}{4}$ " to $1\frac{1}{2}$ ".



Racine Variable Volume Oil Hydraulic Pump — 12 to 30 G. P.M. Pressure 50 to 1000 lbs. p.s.i.



INTEGRATED TO YOUR DESIGN . . . centralized or remote control

Like this press manufacturer, you can readily give your products the advantage of a RACINE "Variable Volume", hydraulic circuit. This feature saves horsepower and reduces heat by simplifying the installation and eliminating unnecessary relief and bypass valves. Important savings in first cost also result.

RACINE Hydraulic Engineers have developed hydraulic operation and control for hundreds of machines and tools. Their experience can be helpful in applying "RACINE Hydraulics" to your present product and on new designs now in the development stage. They will cheerfully review your problems in power movement, without cost or obligation.

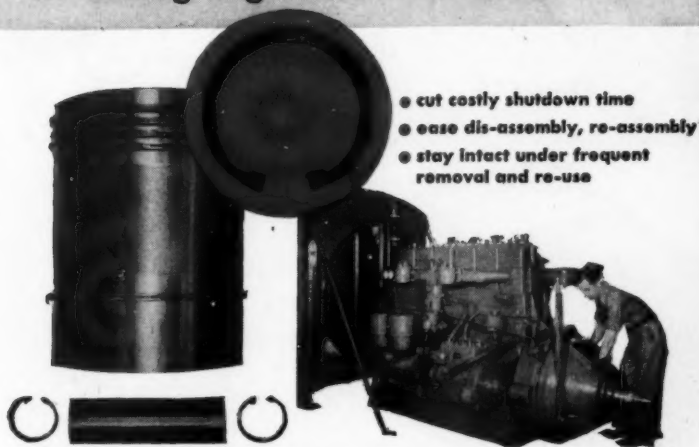
Let us submit detailed recommendations and circuits employing pressures as high as 3000 lbs. p.s.i. Utilize the Variable Volume feature of RACINE Pumps and easy operating, long-lived RACINE sleeve-type valves. Ask for RACINE catalog P-10-C today. RACINE TOOL AND MACHINE COMPANY, 1754 State Street, Racine, Wisconsin.



RACINE

STANDARD FOR QUALITY AND PRECISION

TRUARC rings lock piston pins securely for drilling engine on 24-hour service



- cut costly shutdown time
- ease dis-assembly, re-assembly
- stay intact under frequent removal and re-use

After changing to Waldes Truarc Retaining Rings for piston pin retainers in their powerful new Superior 6G-510 oil-field drilling engine, the Superior Engine Division of The National Supply Company finds field maintenance greatly simplified.

Truarc Rings can be easily removed and replaced in a few seconds. They retain both concentricity and flexibility without regard to the number of times they are handled. Other piston pin retainers take a permanent set, delay field repairs, pile up costs.

On rocker arms and pumps, on crankshafts and plungers, on a wide variety of applications, Truarc Rings do a better job of holding moving parts together. Designers, production and maintenance men in many industries find Truarc cuts costs sharply wherever used. Its never-failing grip is a superior solution to fastening problems. Its patented design assures constant circularity under all conditions. Send us your drawings: Waldes Truarc engineers will be glad to show how Truarc can help you.



WALDES
TRUARC
U. S. PATENT NO. 191,144
RETAINING RINGS

WALDES ROBINHOOD, INC., LONG ISLAND CITY 1, NEW YORK



Send for new Truarc booklet,
"New Development in Retaining Rings"

Waldes Robinson, Inc., 47-10 Astor Place 22-M
Long Island City 1, N. Y.

Please send booklet, "New Development in Retaining Rings" to:

Name

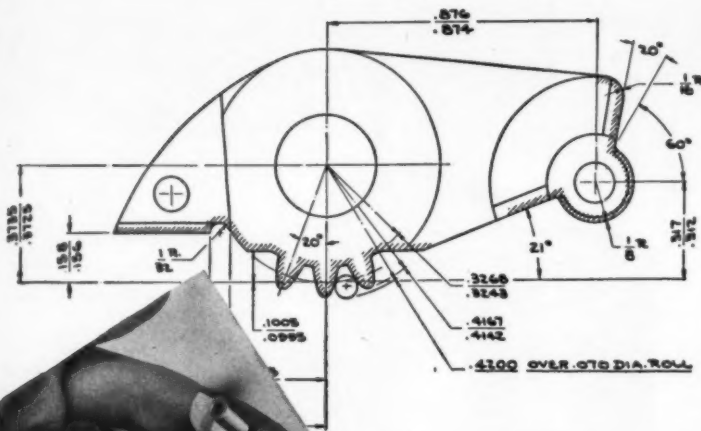
Title

Company

Business Address

City Zone State

When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

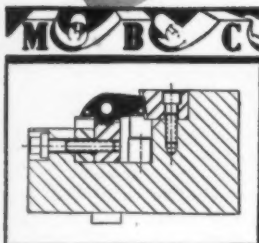


What's so different about *this* part?

Just this—The job was engineered—the tools were built and the part was machined by ONE SOURCE, MICHIGAN BROACH.

This same "complete service" is being performed daily for many customers and being performed at reduced costs. MICHIGAN'S "know how" in designing, building and using broaches makes this possible.

MICHIGAN, long recognized as one of the industry's most reliable sources for broaches, fixtures and gages, also operates the largest commercial machine shop of its kind in the country for furnishing complete parts.



Four milling operations were required to machine this contour. It was broached in one operation. Broaching is faster, reduces scrap, requires less skilled labor.

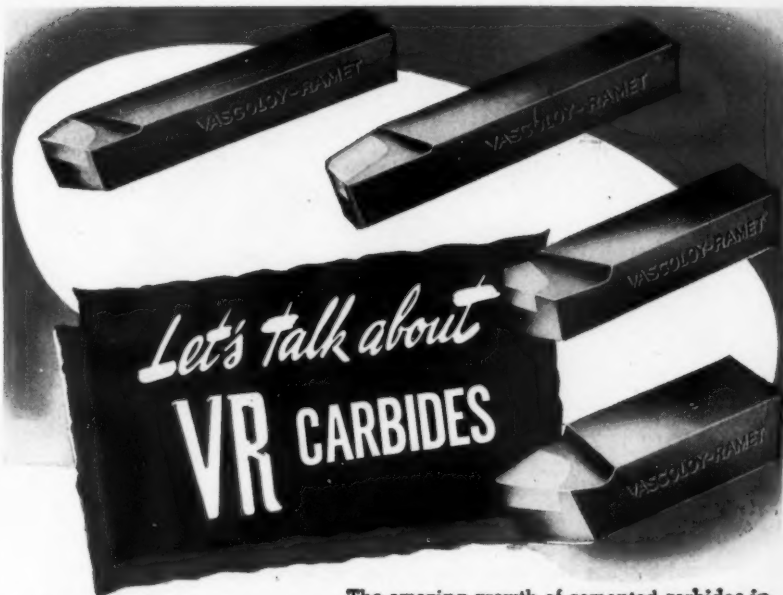
Send your next part to MICHIGAN for machining or have MICHIGAN quote on furnishing it complete.
The new NUMBER 8 folder is off the press. Write for your copy. It dec's with an interesting phase of broaching.



MICHIGAN BROACH CO.

10370 NORTHLAWN AVENUE

DETROIT 4, MICH.



DID YOU KNOW... that a large percentage of economy in carbide tool applications is wasted in converting standard tools to shop requirements. The practical solution to high tool conversion costs is V-R "CUSTOMER STANDARDS." Write or call your nearest Vascoloy-Ramet Field Engineer for full information on your "CUSTOMER STANDARD" tools.

SEND for your copy of the NEW VR-400 Carbide Tool and Blank Catalog, 32 pages of vital carbide engineering data.

Address Dept. TE-247

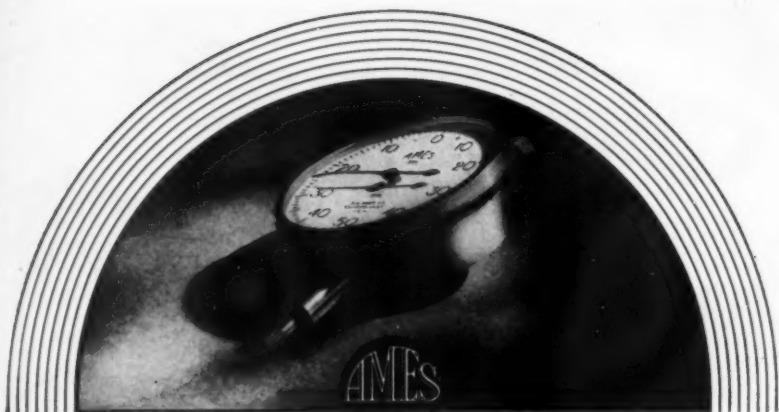


The amazing growth of cemented carbides in the past decade has opened the way to tremendous production increases. Vascoloy-Ramet, manufacturers of V-R Tantalum/Tungsten carbides is foremost in the development of carbides in industry. In keeping with this tradition of leading industry in carbide tool performance, V-R now takes another significant step forward by introducing V-R "CUSTOMER STANDARDS." Studies reveal that most users alter standard carbide tools before putting them to work... an entirely unwarranted cost! **BECAUSE TODAY... V-R "CUSTOMER STANDARD" tools, made to your design, can be used without ANY alterations, available in any grade and quantity at prices, less in fact, than it costs you to alter your present standard tools to shop specifications.**



VASCOLOY-RAMET CORPORATION NORTH CHICAGO, ILLINOIS, U. S. A.

AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY



GOOD IN THE 4TH DIMENSION, TOO!

For tool checking or tough production jobs, Ames Dial Indicators are *time-conserving* as well as sensitive and accurate. They're *quickly* mounted and adjusted. Their dials are *instantly* readable. But *most time-saving* is their ability to stay *right* on the job, without internal adjustment—*longer* than any other indicator, you can buy. Send for illustrated Catalogue.

Representatives in
principal cities

B. C. AMES CO.

28 Ames Street
Waltham 54, Mass.

MANUFACTURER OF MICROMETER DIAL GAUGES AND MICROMETER DIAL INDICATORS

4 Sizes—60 Models

English or Metric Measure

Balance or Continuous Dials

Plain or Compound Movement

Many Graduations and
Roughs



Forged Brass Case and Stem

Hardened Steel Staffs and
Pinions

Forged Wheel Supports

Hardened Steel Guidepin
and Guide Block

Burnt Hardened
Bearings

new *Robbins* INDEX TABLE



A FAST, ACCURATE PRODUCTION TOOL *with 6* BIG ADVANTAGES

VERSATILE—The number and location of the index positions is determined to suit the application. Built in three sizes, the Robbins Index Table is equally well adapted to large or small work.

POSITIVE INDEXING—No slow, hard-to-read dials or scales . . . no guesswork! To index, the handle is turned to horizontal which releases the locking pin . . . as table turns, operator releases handle and table locks automatically in next position.

SAFETY STOP—The Robbins Index Table can be indexed in one direction only. This prevents inexperienced operators from indexing in the wrong direction, thus scraping the work part and often breaking tools.

MAXIMUM VERTICAL THRUST SUPPORT—The Robbins Index Table is fully supported in the center and around the entire outer diameter by special ball bearings, eliminating out-of-

parallel conditions due to vertical thrust from cutting tools. Special design of bearings also prevents brinelling of the races.

EFFORTLESS INDEXING—Center support bearing is also radial thrust bearing on which the table is indexed . . . permitting smooth, easy indexing—reducing operator fatigue.

ADDED LONG LIFE—All parts are of sturdy sections. Working parts are hardened and ground for maximum life. They are concealed from dirt, chips, abrasives, etc. Index table and base are ribbed for extra strength.

Write today for fully illustrated bulletin.
Robbins Engineering Company, 318 Midland Avenue, Detroit 3, Michigan.

 *Robbins*
ENGINEERING COMPANY

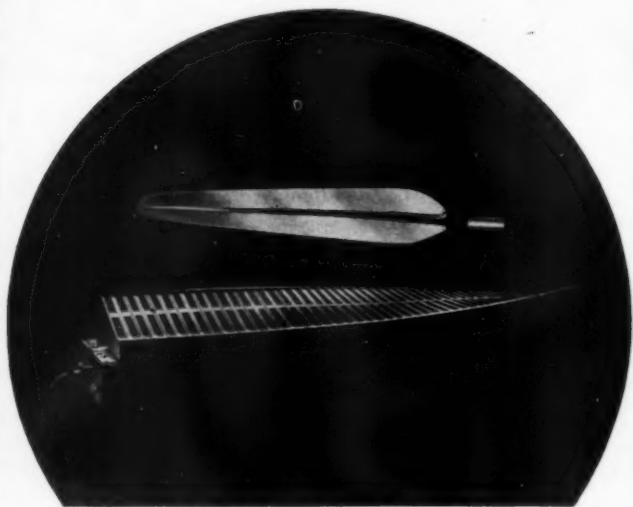
Producers of ROBBINS MAGNA-SINE • ROBBINS UNIV-ANGLE
ROBBINS SINE PLATE • ROBBINS INDEX TABLES • ROBBINS
No. 3 AUTOMATIC DRILLING MACHINE • SPECIAL MACHINERY

Walker Chucks

This Chuck showing sectional Auxiliary Top Plates, interchangeable, used for holding magnetically, aeroplane propellers, for planing and milling operations.

Resulting in substantial reduction in cost.

Another example where Walker Engineering and Design has contributed to lower cost and increased production.



O. S. WALKER COMPANY
INCORPORATED

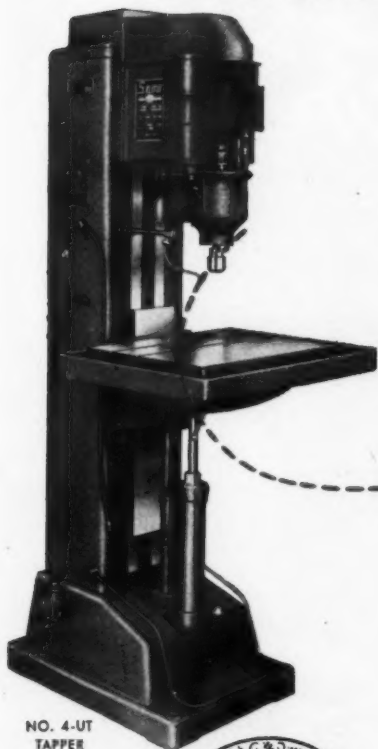
ORIGINAL DESIGNERS AND BUILDERS OF MAGNETIC CHUCKS

MAGNETIC CHUCKS • GRINDING MACHINES

WORCESTER 6, MASSACHUSETTS

AIR OPERATED • ELECTRICALLY CONTROLLED

FUNCTIONS *three* WAYS



NO. 4-UT
TAPPER



the *basic* SNOW AIR TOOL

Time-tested, quality-proven, thousands have been put into use in the past sixteen years. The Snow Air Tool — fundamental tool around which are built—the Snow Tapping Machine, the Snow Drilling Machine, the Snow Threading Machine.

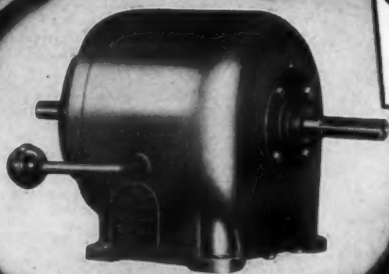
Air operated—electrically controlled, it includes the latest in design. Quick-acting automatic holding fixtures are made fully automatic, semi-automatic or manually operated—all by the turn of a switch.

Send prints or sample parts for production estimates and for quotations. Or write for catalog.



NOW! YOU CAN HAVE... *Multi-Speed*

GEAR REDUCTION DRIVES
FOR NEW OR USED MACHINERY
REQUIRING UP TO 1 hp.



TYPE RD ILLUSTRATED DESIGNED FOR SEPARATE MOTOR DRIVE.
OTHER INTEGRAL LIMA GEARSHIFT DRIVES, SINGLE PHASE
 $\frac{1}{2}$ AND $\frac{3}{4}$ HP., POLYPHASE $\frac{1}{2}$ TO 20 HP.

THE LIMA ELECTRIC MOTOR CO.

250 FINDLAY ROAD

LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES

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New!

FREE CATALOGS ON
Automatic
Punch Press
Feeds

Tells How
DICKERMAN FEEDS
• Reduce Production Costs
• Increase PROFIT MARGINS



Write Today ...for these new fact-packed

catalogs containing valuable time, money and material saving helps for all punch press owners. Many informative and illustrated installation photographs — descriptions of Dickerman Die and Hitch Feeds.

H. E. DICKERMAN MFG. CO.

134 ALBANY STREET - SPRINGFIELD, MASS.



**IT'S A LEMPCO
PRECISION
ANTI-FRICTION
DIE SET**

For increased die life . . . faster production . . . greater economy . . . put Lempco Anti-Friction Die Sets to work for you.

Lempco Die Sets are equipped with ball or roller bearing guide pins. As a result, dies can be set up by hand without the use of hammers, mauls, jacks or pry bars. This eliminates production delays caused by accidents to dies and punches . . . saves up to 60% of die setter's time . . . means extra profit for you.

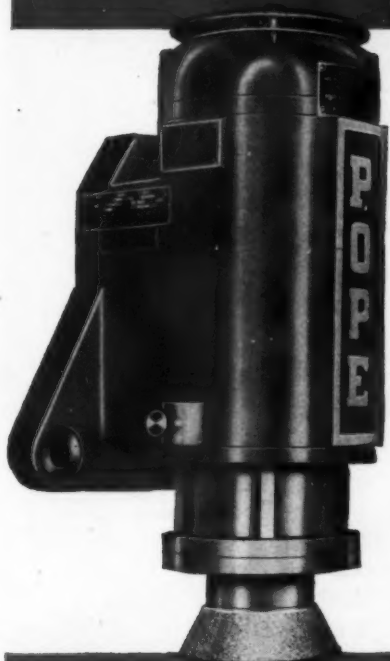
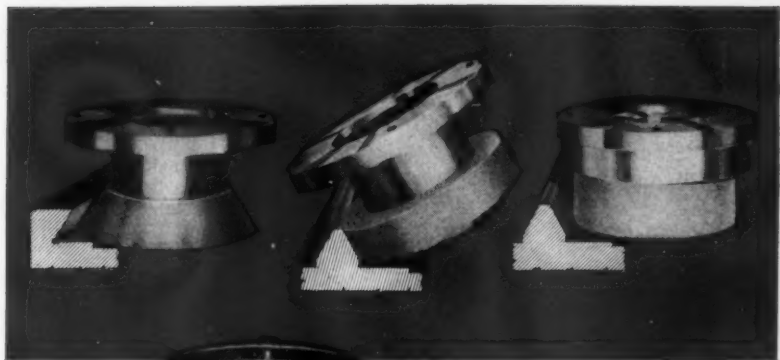
Lempco Anti-Friction Die Sets have been run over long periods on a special press at speeds of *2000 strokes per minute*. To assure positive accuracy, bearings have pre-load of .0015". All surfaces including extremely long bosses are ground to exceptionally close tolerance.

Place your order today and make sure you cash in on all the money-saving features offered by Lempco Precision Anti-Friction Die Sets.

LEMPCO

5929 DUNHAM ROAD, BEDFORD, OHIO

● Write for "Facts About Lempco Precision Anti-Friction Die Sets." It's a fully illustrated catalog which lists all the advantages Lempco Die Sets have for you.



Versatile IS THE WORD FOR
THIS **POPE** MOTORIZED
GRINDER SPINDLE . . .

Every user is enthusiastic about the performance of this powerful Spindle with *sealed-in* lubrication and totally enclosed, fan cooled motor. It has the bearing capacity and the rigidity to *rough off surplus metal fast* and produce superior final finishes as well.

As you see, it may be equipped with a wide flange spindle nose for *quick mounting* of various types of grinding wheels or other tools which are readily attached by *easy-to-get-at* screws. No fumbling around for blind holes.

This useful and popular Spindle comes in 3, 5 and 10 HP, 1200, 1800 and 3600 RPM. Other HP's and speeds are available on special order. Write for Data Sheets 16, 17, 18 and 19.

No. 42

POPE

POPE MACHINERY CORPORATION

ESTABLISHED 1908

661 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

CRITERION *Boring* HEADS

Featuring
**EXTREMELY
RIGID**
Construction



Criterion Boring Heads are particularly adapted to the use of carbide tools due to their extremely rigid construction. Their accuracy, utility, and interchangeable feature rate the highest praise from operators

everywhere. Lead Screw ground from solid AFTER hardening. Order from your dealer. Request free literature.



Write: Attention Dept. B

C RITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

East Shore Announces

purchase of manufacturing and sales rights of the State Boring and Reaming Tool and allied products. These tools are now being produced in the East Shore Factory, well known for years of manufacture of precision automotive parts, the Glenny Broach, etc.

The GLENNY

Adjustable - Expansion
KEYWAY PUSH BROACH

Broaches keyways accurate to $\pm .0005$, either quantity production or small lots at a new low cost.



The DIALSET BORING TOOL

A single cutter boring bar which adjusts to positive accuracy through micrometer adjustment.



The EAST SHORE GEAR PUMP

Taper Principle

A positive displacement unit for liquids having lubricating properties, water, coolants, chemicals, gasoline, hydraulics etc.



INCREASE
EFFICIENCY
with EAST SHORE
Precision Products...

SEND FOR
PARTICULARS

The STATE BORING & REAMING TOOL

Patented, multiple, interlocking cutters that bore and ream at the same operation. Higher speeds, greater feeds than single point or double end cutters.



The STATE Adjustable CORE DRILL

The modern replacement tool for fixed center drills—greatly reducing cost per hole.



The VELSEY Black Granite SURFACE PLATE

Olivine Diabase, a superior form of black granite, which produces in the Velsey the most accurate commercially produced surface plate.



THE
EAST SHORE
MACHINE PRODUCTS CO.

Dept. AA Cleveland 10, Ohio

The East Shore Mach. Prod. Co.
Cleveland 10, Ohio

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City _____

Zone _____

State _____

SEND INFORMATION ON

GLENNY BROACH	STATE CORE DRILL
STATE BORING TOOL	DIALSET
EAST SHORE PUMP	VELSEY Surface Plate

This
**TURNING
TOOL . . .
Replaces
14 TOOLS**



R and L

You can change R and L tools from right to left or vice versa in 10 seconds and it is the only tool of its kind on the market. No time is wasted in set-up. R and L performs several simultaneous operations such as turning shoulder concentric with stock diameter; turning two diameters while drilling or reaming; turning one diameter — chamfering two corners, facing end of part along with drilling or reaming; turning and forming special shape on end of part while drilling or reaming; drilling and chamfering; pointing work concentric with diameter.

You can save in first cost as well as production by using R and L Tools.

Let us send you detailed information. Delivery from stock.

**Can be changed from
RIGHT to LEFT
. . . in 10 Seconds**

R AND L TOOLS

1825 BRISTOL ST., NICETOWN, PHILADELPHIA 40, PA.

THE ONE AUTO-TOOL FACTORY



BEHOLD MANY

GOOD THINGS AHEAD

It is reported that

Ralph C. Coxhead Corp. of New York has a new Vari-Typer that uses 600 styles and sizes of type, plus foreign language, chemical, mathematical and other symbols.

get ready with CUNE for tomorrow

Patent 2,409,181 covers a sectional motor truck that can be separated into three pieces and carried anywhere by air.

be ready with CUNE for today

Stromberg-Carlson has a new inexpensive adaptor that will enable most owners of pre-war FM sets to receive broadcasts on the new band.

get ready with CUNE for tomorrow

Frigidaire, Division of General Motors, is making a plastic lid for its ice cream cabinets that is claimed to be 50% lighter than steel.

be ready with CUNE for today

New England Carbide Tool Co. is taking tungsten carbide to the housewife in its new precision knife sharpener.

get ready with CUNE for tomorrow

The State of Minnesota will go into business with Continental Machines, Inc. to engage in a continuous chemical process for the extraction of pure iron from slate formerly wasted at the Mesabi iron range.

be ready with CUNE for today

The New Holland Machine Co. of New Holland, Pa., will test its new flame cultivator on truck and garden crops in the Rio Grande Valley this winter.

get ready with CUNE for tomorrow

Bell System's first experimental rural radio-telephone circuit connects 8 Colorado farms with the Cheyenne Wells central office. Wind driven generators supply power.

The four largest alternating current motors ever built, 65,000 horsepower each, will be made by Westinghouse for Grand Coulee.

be ready with CUNE for today

Lockheed's Little Dipper light plane is reported to cruise at 100 m.p.h. and land at 20.

get ready with CUNE for tomorrow

A mobile alcohol plant built into a five car train that could travel from farm to farm was demonstrated at the National Chemical Exposition.

be ready with CUNE for today

Phthalic anhydride, one of the most important ingredients in the manufacture of paints, is now being made from petroleum by Oronite Chemical Company.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Climax Molybdenum Corp. is working on two new high temperature alloys. One has 60% chromium, 25% molybdenum and 15% iron. The other has 60% chromium, 15% molybdenum and 25% iron.

get ready with CUNE for tomorrow

The Gyro-Glider developed at the General Electric Flight Test Center has a rotor instead of wings and weighs 120 pounds, ready to fly.

be ready with CUNE for today

M. W. Kellogg Co. has a new process for separating a considerable number of useful substances from fish and vegetable oils using liquefied propane at high pressure.

get ready with CUNE for tomorrow

The Texas Company's new cold weather aircraft fuel is claimed to start an engine and to permit switching to regular aircraft gasoline in two minutes, in spite of extremely low temperatures.



**MORE facility
is MORE value**

The 3" 4-Spindle Compressor, ordinarily assigned to rugged jobs, produced the brass pieces shown in 6 seconds each, including tapping.

Add your CUNE representation to show your own color motion picture



CUNE

AUTOMATIC MACHINING CO., INC. • NEWTON, MASSACHUSETTS, U.S.A.

MOTOR TOOL *LIVE* CENTER

WILL *Outlast* A BASKETFUL
OF *Ordinary Centers*

Here's Why!

You no longer have to guess whether you are overloading **MOTOR TOOL Live CENTERS**. When the load is too great a **RED BAND** around the spindle disappears into the housing. You can see at a glance when overloading occurs.

This is an [exclusive feature, developed by **MOTOR TOOL**, that cuts **MOTOR TOOL Live CENTER** repairs to practically nothing—immeasurably **INCREASES** their life—and puts an end to burnouts, breakdowns and work spoilage.

Write
for **NEW**
Descriptive
Folder

MOTOR TOOL MANUFACTURING CO.
METAL CUTTING TOOLS

7773 CORTLAND AVENUE • DETROIT, MICHIGAN

*Make it a Rule
to Call Motor Tool*

Fast as a Blue Streak

MAGIC TYPE

QUICK-CHANGE CHUCKS



A good stock of Quick-Change Chucks is maintained from which requirements for most sizes can be filled immediately. See pages 98-102 of Scully-Jones Catalog No. 500.

Save set-up time with this "Magic" Quick-Change Chuck. Presto-Change-O, you change tools in your Drill Presses, Vertical Tapping and Boring Machines...insert Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps or Special Tools, without stopping spindles!

When you raise locking ring, collet drops out automatically for a quick, safe tool change. Four styles of collets available—"AA", "A", "D" and "E" to accommodate various tools. Adds many stations to your machines.

Consult our engineers on adapting "Magic" Quick-Change Chucks and Collets to your production problems. Send us your sketches or blue prints for recommendations and quotations.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones

AND COMPANY

1907 SOUTH ROCKWELL STREET • CHICAGO 8, U.S.A.

When Writing Advertisers Please Mention MACHINE and TOOL BLUE BOOK

DESIGN

It is a thoroughly recognized fact that the design of a machine is of prime importance in determining its performance, economy and useful life.

RANGE

Selection of size, design, material to meet every requirement, manufacture of machines from 100 to 100,000 lbs. per day.

SERVICE

When "Harnett" needs are recognized, parts which are standard by us. There are 70 factories working under license in the U.S.A. — there is not one else.

30 YEARS' SATISFACTION


There is no other name in the world for the making of machines and the satisfaction of them. Our customers are not buying steel.




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Ben Hall Tool Co.
1967 W. Madison Ave.
Chicago 12, Ill.




Harris Pump & Supply Co.
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P.S. Pittsburgh 2, Penn.



Mr. G. E. Jones
Loversley Feed Co., Inc.
5280 Jay Road, Rm. 408
Detroit 4, Mich.



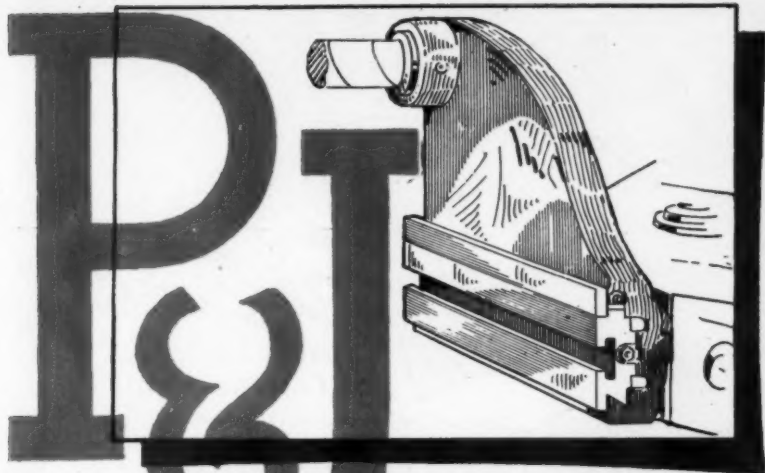
Williams-Collins, Inc.
3409 West State St.
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George C. Zerkall Co.
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Portland 4, Ore.

Lampco International, Inc.
All Foreign except Latin
& South America
3400 St. Germain & Assoc.
Latin & South America

April, 1947



SLIDE TOOL . . . with Overhead Pilot

This versatile, horizontal Slide Tool is designed for use with a considerable number of Potter & Johnston Machines.

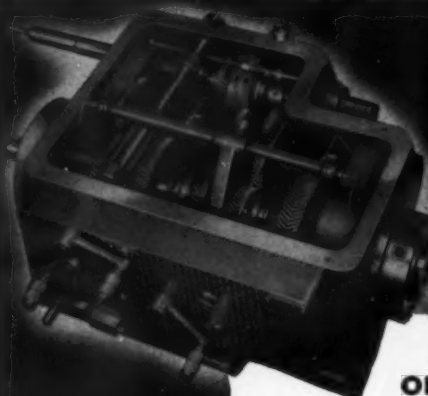
For heavy facing cuts, several cutter blocks may be held in the Slide, which is fed either to the rear or to the front of the machine by a pusher attached to the Machine Cross Slide. This sturdy fixture is of ample proportions and its rigidity is multiplied by the Pilot bar, allowing accurate and rapid stock removal from the work pieces. It is made with T-Slot on Center and Off Center.

This versatile tool is but one of many speedy, efficient production tools comprising the Potter & Johnston line. It will pay you to investigate these profit producing tools.

- Post-war competition will demand modern tooling in the battle to reduce production costs. This helpful catalog will give you many constructive suggestions for increasing production and cutting costs. If you use Potter & Johnston machines, it will pay you to write for a copy—no obligation.



**The POTTER & JOHNSTON
MACHINE CO. PAWTUCKET, RHODE ISLAND**



Sidney Lathes

INCREASE LIFE OF CARBIDE TOOLS

The continuous tooth contact of Sidney's All-Herringbone Geared Headstock produces a smooth flow of power and creates pressure of constant intensity on the cutting tool . . . This constant pressure is especially desirable when using carbide tools by preventing tool breakage caused by shock or intermittent pressures.

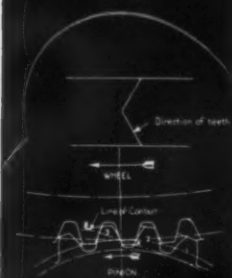


FIG. 9
VIEW IN PLANE OF ROTATION

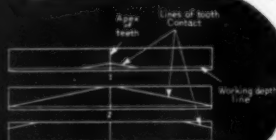


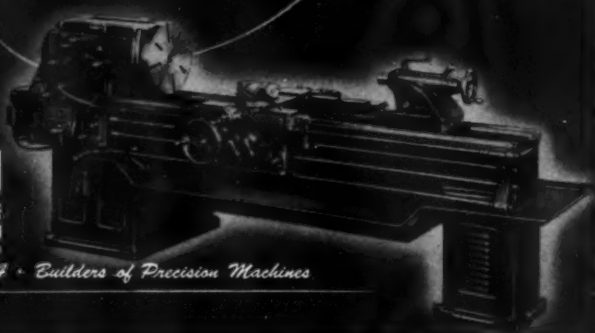
FIG. 10
DEVELOPMENT OF TEETH IN CONTACT

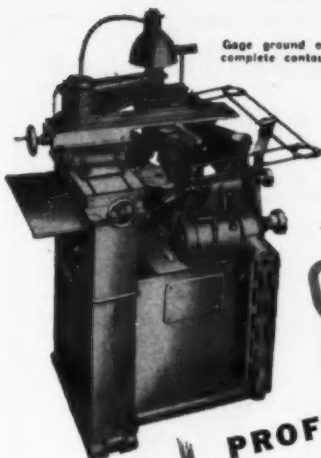
Illustrated at Left

is the nature of contact between two mating herringbone gears. Pressure is evenly divided over three teeth with no tendency for tooth contour to wear unevenly. Full descriptive bulletin available.

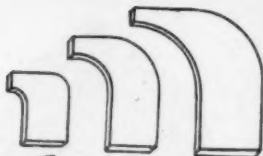
THE
SIDNEY
MACHINE
TOOL COMPANY
SIDNEY • OHIO

Established 1904 • Builders of Precision Machines





Gage ground on complete contour



Various radius gages ground from same template



Circular form tool produced in 2½ hrs.

Profile gage 2.4" long ground in 4 hrs.



Form tool ground on complete contour

STUDER PROFILE GRINDER

VERSATILITY!

Grind straight or round form tools, sectional dies, templates, small dies and precision parts! Work up to 6" in length, 4" in diameter, 2" in thickness can be handled. Special template holder permits grinding of circular contours over entire circumference.

SPEED!

Only one set up is necessary for grinding any shape in one continuous operation, without removing work piece or template. Several flat pieces may be stacked for simultaneous grinding. Small profiles can be accurately produced without preliminary grinding to form, and clearances on parts such as form tools can be ground without changing the original setting.

ACCURACY!

A tracer finger follows the form of a template and transmits its movements to the grinding wheel through a pantograph. Because the wheel is shaped proportionately to the exact shape of the tracer finger, parts are ground complete in one operation. Fixed template eliminates errors due to incorrect manipulation. These features insure accuracy to within $\pm 0.0002"$. Our engineers will give you expert assistance in specific applications.



Set of profile gages produced in 3 hrs.

TUNGSTEN CARBIDE TOOLS can be ground rapidly and accurately with the Studer Profile Grinder. A special diamond wheel dressing device, equipped with a Carborundum cup wheel, assures accurate forming of bakelite and metal bonded wheels.

C O S A
CORPORATION



CHRYSLER BUILDING
New York 17, New York



UNBRAKO

Reg. U. S. Pat. Off.

This "Unbrako" Socket Head Cap Screw with the Knurled Head saves time, facilitates compact designs, reduces weight and cost. The knurling provides a slip- and fumble-proof grip—even though the fingers and heads be ever so oily—therefore, it can be screwed-in faster and farther before it becomes necessary to use a wrench. Available in sizes from No. 4 to 1½" in diameter and a full range of lengths, millions upon millions are in use throughout industry. Write for your copy of the "Unbrako" Catalog.

You can't screw socket screws in or out without a hex socket wrench, so why not get our No. 25 or No. 30 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

• •

OVER 44 YEARS IN BUSINESS

◀ **THE KNURLED HEAD
SAVES
ASSEMBLY TIME**



Knurling of Socket
Screws originated with
"Unbrako" in 1934.

"Unbrako" and "Hallowell" Products are sold entirely through distributors.



KITS:
Pats.
Pend.

STANDARD PRESSED STEEL CO.

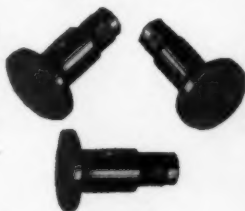
PHILADELPHIA, PENNA. BOX 600 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO



Standards Upset!

337% GAIN in Cutting-off Operation

Speeds and feeds—337% better than those set up as standards in cut-off operations—were made possible through the use of Luers standard high speed blades in the manufacture of these clutch shaft studs for motion picture projectors. Production was more than trebled.



(And to think that the customer at first thought he couldn't produce the job with anything less than tungsten carbide blades!)

Here are a few interesting facts: Tool ran 24 hours between sharpenings. Material B-1113. Diameter $\frac{1}{2}$ ". R.P.M. 3500. Feed .004. Tolerance +.002 —.000 on length of piece.

It will be well for you to look into your cutting-off production. You may be missing something without realizing it. There's an Empire engineer in every principal city. The nearest one will be glad to discuss these matters with you.

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

EMPIRE

PHOTO COURTESY
ZENITH MFG. CO.,
DETROIT, MICH.

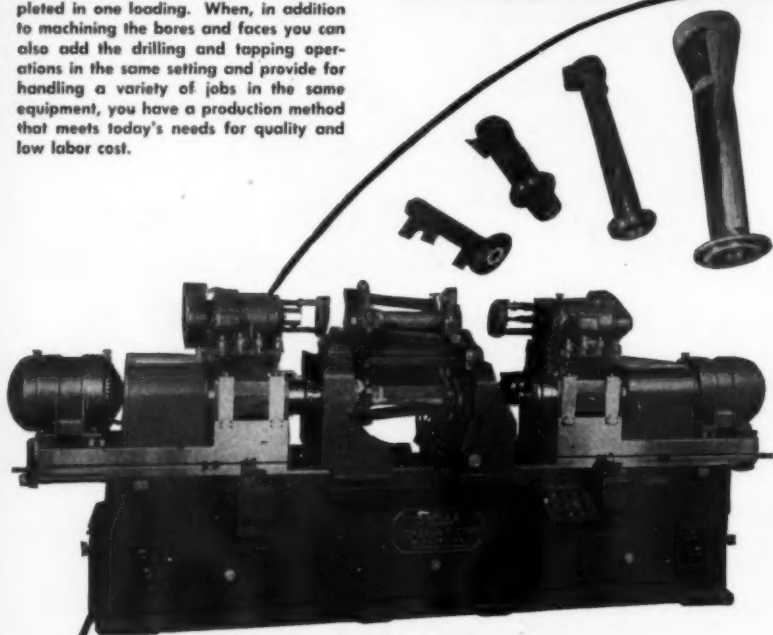
8774 GRINNELL AVE.

TOOL COMPANY

DETROIT 13, MICHIGAN

SIMPLEX

Machining tubular parts where the bores must be concentric, the faces parallel, is a difficult job unless the work can be completed in one loading. When, in addition to machining the bores and faces you can also add the drilling and tapping operations in the same setting and provide for handling a variety of jobs in the same equipment, you have a production method that meets today's needs for quality and low labor cost.



The machine pictured is a SIMPLEX 4U 2-way Precision Boring Machine with four #4 spindles mounting combination boring and facing heads and also carrying unit type drilling heads with bushing plates for the drilling operation. By changing the fixtures, drills and boring tools, the various pieces illustrated can be handled with the same machine, thus this machine becomes in effect a production department in itself.

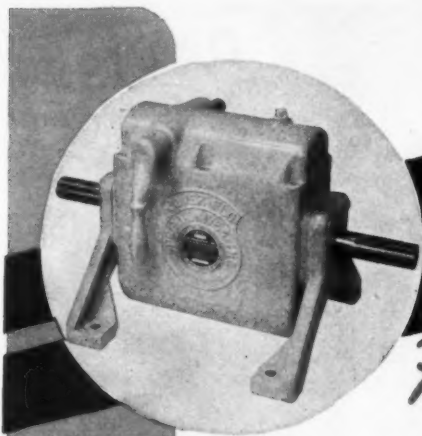
Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4530 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools



**POWER-FLO
MACHINE DRIVES**

Precision Built
TO DRIVE

**IMMEDIATE
DELIVERY**

- ★ Machine Tools
- ★ Conveyors
- ★ Food Processing Machines
- ★ Mixers
- ★ Extractors
- ★ Blower Fans
- ★ Textile Machines
- ★ Mill Equipment
- ★ Mining Machines
- ★ Special Machines

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AND FREE CATALOG**

SPEED-DRIVES, INC.

23215 HOOVER ROAD E. DETROIT, MICHIGAN

P. O. BOX 303

EXPERIENCED DEALERS FROM COAST TO COAST

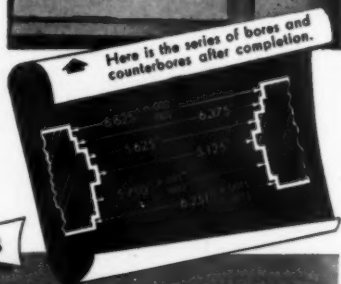


A Davis Micrometer Adjustable Flycutter Stub Bar is used to rough bore these holes, while Davis Block-Type Cutters in the line bar shown simplify all finishing operations.

OPERATOR QUICKLY LOCKS PRECISION GROUND-TO-SIZE BLOCK CUTTERS IN BAR AND COMPLETES BORING WITHOUT FURTHER MEASURING

Six Davis Block Cutters are used to semi-finish and finish bore six different diameters on each nozzle hole of this weldment. Cutter blocks are easily inserted and quickly locked in the line bar for boring, counterboring and back boring operations in a single work setting.

Cutters are ground to size in the tool room and the machine operator does not have to gauge or measure each cut taken. This handling insures accuracy to .0005" on individual bores where required.



FACTUAL DETAILS ABOUT THIS JOB

1. Rough bore all holes with Davis Micrometer Adjustable Flycutter Stub Bar. (Not shown in illustration.)
2. Rough bore each diameter and each hole with Davis Micrometer Adjustable Flycutter Stub Bar. (Not shown in illustration.)
3. Redneck setup.
4. Semi-finish bore and finish bore 5/16" dia. with Davis Block Type Cutters in one pass.
5. Semi-finish and finish 3/32" dia.
6. Semi-finish and finish 6.375" dia.
7. Semi-finish and finish 6.625" dia.
8. Semi-finish and finish 6.750" dia.
9. Semi-finish and finish 6.931" dia.

Individual Davis Block-Type Cutters are used for finishing each diameter and are quickly changed after each boring operation.



DAVIS BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Company
144 Dely Street, Fond du Lac, Wisconsin

Profit Now!

by obtaining Davis engineering help on your difficult boring problems. And be sure to ask for free Production Data Folder BB-47.



DESIGNED to eliminate the costly procedure of setting up the dies every time a job is repeated. "Standard" All-Steel Die Sets decrease set up time and lengthen tool life.

BUILT for the same long, productive service as the universally used "Standard" Power Presses.

Set up your dies only once — the first time — in a "Standard" All-Steel Die Set. Then they'll be ready every time the job is repeated. Used with any make of press — sizes to fit your needs. Prompt shipment offered on all catalog sizes. Write for catalog.

STANDARD MACHINERY COMPANY

1555 ELMWOOD AVE., PROVIDENCE 7, R. I., U. S. A.

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The Die Supply Co.
5349 St. Clair Ave.
EXpress 1133

DETROIT

Diemaker Supplies Co.
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WORCESTER

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BLADE PRESSURE
*Positively
Controlled*

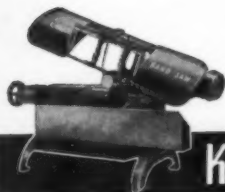


A FEATURE OF THE KALAMAZOO METAL CUTTING BAND SAW

The adaptability of the Kalamazoo Metal Cutting Band Saw to all types of cut-off jobs is truly amazing. Heavy bars — tubing — hard metals — or soft metals can all be cut rapidly and accurately — as there is an instant adjustment to provide the correct saw blade pressure.

A lever operated cam having five positions is within easy reach to quickly adjust the spring tension to the job. Four holes are also provided to change cam location to compensate for weakening of spring.

Ask your dealer or write direct for complete information.



MACHINE TOOL DIVISION

Kalamazoo Tank & Silo Co., Kalamazoo 16, Michigan


In Canada—Bridge Machinery Co.—Montreal

Kalamazoo Metal Cutting Band Saw

SPECIAL PURPOSE DRILLS



LARGE DIAMETER SPADE DRILLS FROM STOCK
DEEP HOLE DRILLS
GUN DRILLS

 **Note**—Drill large holes
from the solid. No
lead drill necessary!

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TOOL & CUTTER CO.
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BARNES BAND SAWS



*... for greater efficiency
in metal sawing!*

*The Barnes Line
of Metal Cutting
Band Saws Includes:*

- **HARD EDGE
FLEXIBLE BACK**
- **ARC - LINE
(Narrow width for
Contours)**
- **SKIP TOOTH**
- **SPRING TEMPER**

TRY Barnes Band Saws and prove the above statement to your own satisfaction. Barnes Band Saws have: (1) Correct tooth form for ease in cutting; (2) Uniform set to give straight, smooth, accurate cuts; (3) Proper hardness and temper for long blade life; (4) Utmost care in welding necessary to provide strong, endless saw.

YOUR Industrial Distributor or a Barnes Service Engineer will gladly recommend the Barnes blade designed and made for your particular band saw operation.



ESTABLISHED 1919

W. O. BARNES CO., INC.

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PUTNAM End Mills are used extensively in the great manufacturing industries producing equipment for America's mass transportation facilities. For fast delivery —from complete stocks —of any of the over 800 different types and sizes of standard Putnam End Mills, call the Putnam Distributor nearest you.



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PRECISION HONING MACHINE

Will Accurately Finish All Internal
Diameters from .125" to 2.625"

The wide range of sizes which the Sunnen Precision Honing Machine will handle makes it adaptable to thousands of jobs in production plants, tool and die shops, maintenance shops and salvage departments. Honing heads and stones are available to hone any kind of metal, plastic or ceramic material except lead and babbitt.

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SUNNEN PRODUCTS COMPANY, 7935 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

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Typical Examples



Miniature aircraft cylinder—smooth, accurate honing provides better compression, and longer life.



Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



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CUSTOM TAILORED GRINDING WHEELS

"Built in" Fractional Grades in any size Bay State grinding wheel provides a wider range for a more precise selection. This exclusive Bay State development produces wheels of three distinct degrees of hardness within the range of one normal grade.

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Chicago — Detroit
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STATE**



Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.

PRECISION CENTERED EYE BENDING

A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

with DI-ACRO BENDERS

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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"DIE-LESS" DUPLICATING

showing many kinds of "DIE-LESS" DUPLICATING" produced with DI-ACRO Benders, Brakes and Shears.



Pronounced "DIE-ACK-RO"

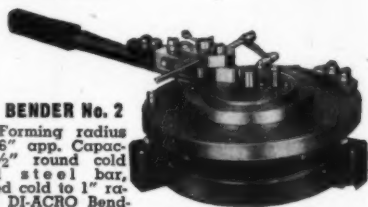
BENDER No. 1

Forming radius 2" app. Capacity $7/32$ " round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.



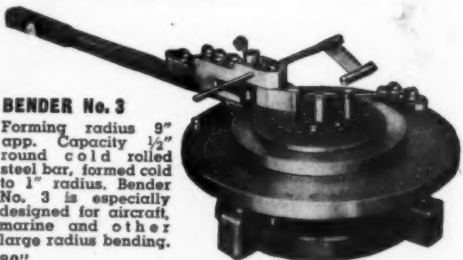
BENDER No. 2

Forming radius 6" app. Capacity $1/2$ " round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edge-wise.



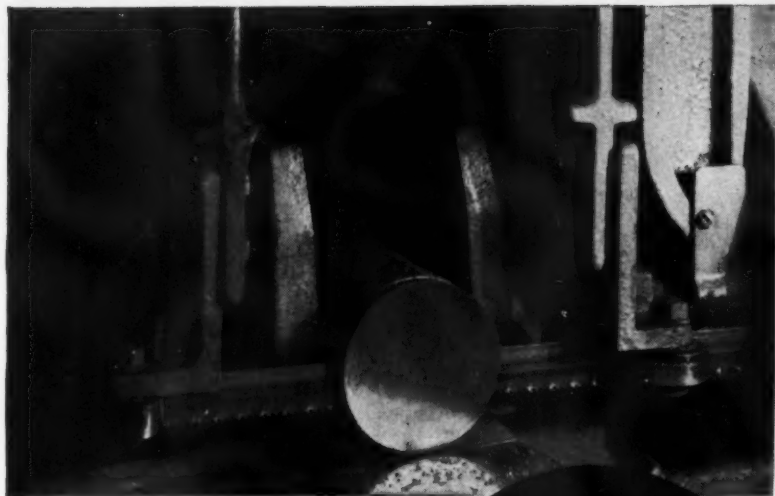
BENDER No. 3

Forming radius 9" app. Capacity $1/2$ " round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.



O'NEIL-IRWIN MFG. CO.

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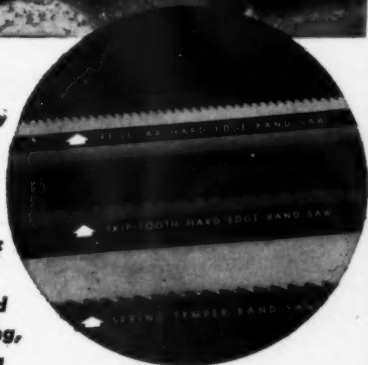
Climb on the **SIMONDS** "BAND-SAW WAGON"



**Save Thousands of
Hours by Band-Saw
Cutting . . . instead
of Shaping, Milling,
Turning, Drilling**

Getting to be a "Big Parade" . . . the way shops are swinging to metal band-sawing . . . and keeping their one-purpose machines free to do the work for which they were designed. Simonds Metal-Cutting Band Saws can do a score of jobs, and do them all at top speed and accuracy . . . cut-off work, contour cutting, and cutting of irregular shapes like jigs, dies, fixtures, as well as heavy straight production cuts . . . and many other similar jobs.

And Simonds Metal Bands earn top profits on these jobs because they're made to *stay* on the job many hours longer . . . running smoothly, easily, cleanly. Simonds special steel, perfect tooth-milling and even tooth-set . . . those are the Simonds extras that *pay you extra* on every Simonds Metal Band you buy. Order from your distributor today.



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A 7-Hole Drilling Operation Simplified

Two Model "K" and 5 Model "C" Govro-Nelson Units on set-up designed and built by Reed Prentice Corp., Worcester, Mass., to drill simultaneously 3-7/32", 2 No. 44, and 2 combination 7/32" drill x 7/36" counterbore holes in die-cast aluminum housings. Drilling time, 2 seconds.

This is an example of how holes of different sizes and at different angles can be drilled simultaneously by the use of Govro-Nelson Units, greatly reducing production costs.

Send for literature giving list of prominent users, together with typical applications covering a variety of drilling jobs.

WRITE FOR
Literature

GOVRO-NELSON CO.

1933 Antoinette
Detroit 8, Mich.

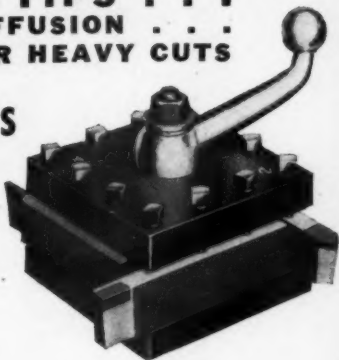
Automatic **DRILLING UNIT**

LARGER TOOL SHANKS MEAN BIGGER CARBIDE TIPS . . . FASTER TOOL HEAT DIFFUSION . . . EXTREME RIGIDITY UNDER HEAVY CUTS

Enco LATHE TURRETS

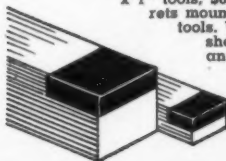
Among the many advantages of Enco Lathe Turrets is their ability to mount maximum size tool bits, high speed or carbide. The result is fewer "grinds," less downtime for tool changes, less tool breakage and longer tool life. Under heavy cuts the extreme rigidity of a larger tool shank is necessary for faster operation and finer finish. More tools may be mounted for speedy production . . . larger tools for operation economy with Enco Lathe Turrets.

The carbide tip on a $\frac{3}{4}$ " square tool shank is TWICE the size of the tip on a $\frac{1}{2}$ " square bit. Solid tools — high speed or carbide — are used where rigidity and accuracy are necessary. Enco Turrets permit increased efficiency of your lathe by mounting larger tools.

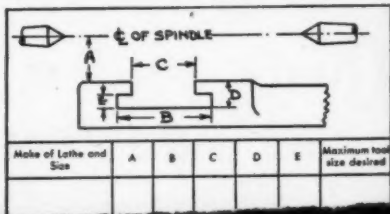


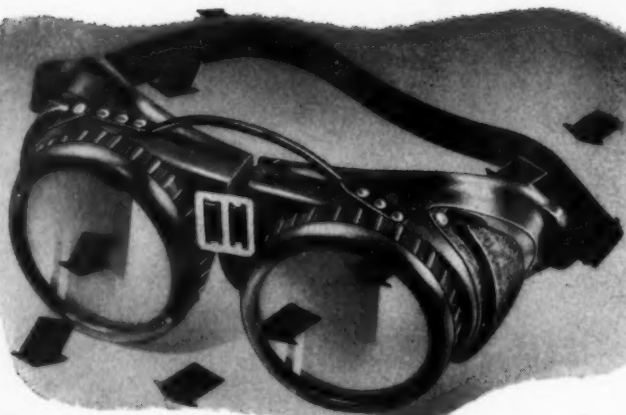
Model
R-4 $\frac{1}{2}$

Model R-4 $\frac{1}{2}$ mounts up to $\frac{3}{4}$ " x 1" tools, \$66.50. Other turrets mount up to 2" high tools. When ordering, show tool size and dimensions.



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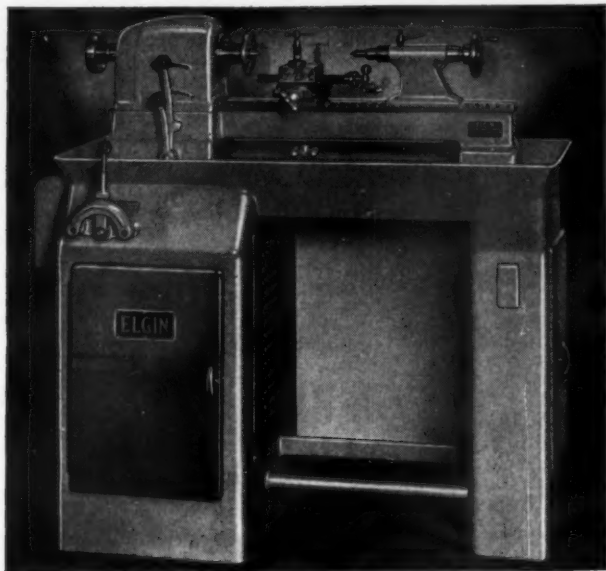




Series 70 cover-spectacle goggles.

Three and a Half Ounces of PREVENTION

...molded plastic construction.



ELGIN

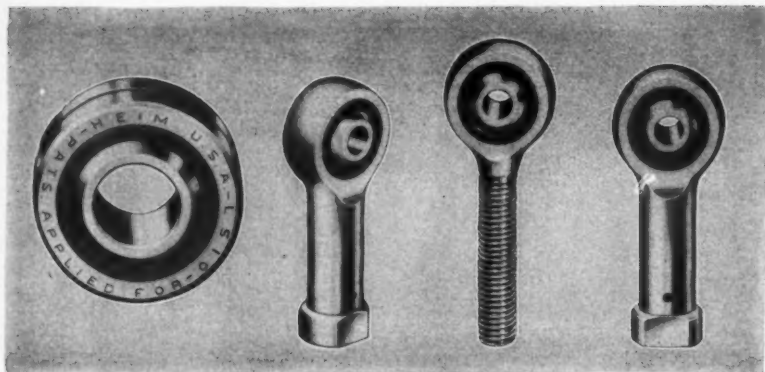
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- The "Elgin Line" now is furnished with knee-hole bases with foot rests, permitting operator to sit comfortably, close-up and directly in front of work.
- Motor is mounted in base with direct cross ventilation.
- Three shelves are provided on right hand side.
- Collet board is on left hand door, below the convenient centralized controls.
- Variable speed drive provides stepless spindle speeds from 40 to 4000 rpm.

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SPHERICAL BEARINGS **AND** **SPHERICAL BEARING ROD ENDS**

Out of this war have come many new devices and improved methods, but one which has already received the acclaim of the aircraft industry in particular is the revolutionary design and construction of these Spherical Bearings and Spherical Bearing Rod Ends.

We are now prepared to offer to American industry in general the complete line of Heim Spherical Bearings and Rod Ends which open up an entirely new field of application wherever this type of bearing is used.

With a greater surface contact area than any of the conventional types, these bearings have a greater carrying capacity and will take radial and thrust loads heretofore thought to be impractical. Where maximum misalignment is essential, nothing can take their place.

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THE HEIM
FAIRFIELD



COMPANY
CONNECTICUT

"MAXITORQ"

IS *Profit* TALK
TO CLUTCH USERS

When we first talked about CLUTCHES, more than 40 years ago, we meant the "Johnson" . . . then a basically new idea in clutch construction. It was a fine clutch at that time, as it is today.

But the "MAXITORQ", our present model is the culmination of all those years of trying to do just one thing . . . build the most positive, dependable, compact means for power transmission that could be devised.

Many leading machine designers tell us we have accomplished this purpose with the Maxitorq . . . and are proving it with their continuing orders. Here are some of their reasons for Maxitorq preference:

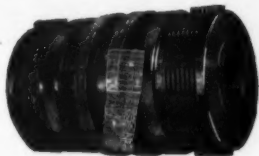
- 1 The Maxitorq comes in one compact unit . . . ready to slip on a shaft.

A new publication, giving complete engineering data has just been printed.

SEND FOR CATALOG NO. BB4 TODAY.

- 2 No tools whatsoever are required to adjust, take apart, or reassemble the clutch.
- 3 Patented Separator Springs hold the discs apart in neutral (you can see between them). Therefore no drag, no abrasion, no heating.
- 4 Disconnect is fast, positive. No slipping from neutral.

And . . . if you have a power transmission problem for high speed, automatic machinery which processes damageable or breakable products . . . the **MAXITORQ** Automatic Overload Release Clutch will positively answer all demands for instant disconnect and full safety.

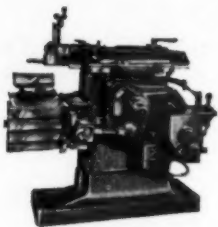


STANDARD MAXITORQ, DOUBLE TYPE

STANDARD MAXITORQ made in single and double types, wet or dry, from $\frac{1}{4}$ to 15 h.p. at 100 rpm. OVERLOAD RELEASE MAXITORQ made in single type, $\frac{1}{4}$ to 5 h.p. at 100 rpm. PULLEY and CUT-OFF COUPLING types also available.

Let's talk
MAXITORQ

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT



Henley 12" shaper

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. . . for the hand and eye of an experienced workman—and, when he's guided by the philosophy that a machine tool must be built to the highest standards of precision workmanship, the result can only be a better machine. For over 75 years Henley has been building machine tools. Today, many of its machinists are sons or grandsons of men who grew up with Henley. Instilled in their minds is the philosophy of Henry J. Henley, and over 75 years of invaluable experience is bred into their hands. That's why today we can invite you to compare the productive capacity and precision of a Henley machine with any other similar machine on the market.



*Henley 18 speed Precision Tool room Lathe
Complete details on request*

The Henley Machine Company

Main Office and Plant — Torrington, Connecticut

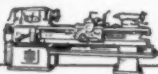
Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

Representatives in — Philadelphia, Cleveland, Pittsburgh

Henley

TOOL ROOM LATHES

12" - 14" - 16" - 18" - 20"



SHAPERS

12" - 16" - 20"

DON'T EXPECT 1947 EFFICIENCY FROM A "GAY NINETIES" CLUTCH

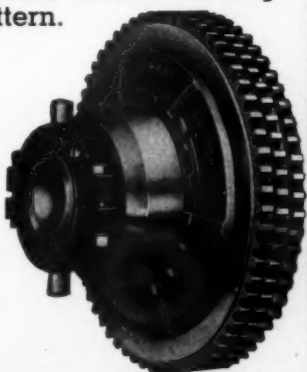
You will be amazed at the difference a 1947 model clutch can make in the efficiency and economy of your power flow. Frankly, you can't expect an antique to fit into the modern, smooth-flowing industrial pattern.

So . . . to make sure you are getting the most from your clutches . . . install

Standardized **CONWAY CLUTCHES**

With Interchangeable Parts

You'll get precision design, precision engineering, clutches entirely machined from basic materials, and every desirable feature. Simplified construction free of all superfluous parts.



*Illustrated is Gear Tooth Drive
Triple Plate Mechanism*

Drop us a line for Bulletin
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Patented in U.S.A. and Canada

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CHIPPING



SCALING



COMPRESSORS • AIR TOOLS • ROCK DRILLS
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GRINDING

Modern practices for producing good sound welds put equal emphasis on the preparation for welding—the welding—and the finishing of the weld. High-quality welds require careful performance of all three phases.

Ingersoll-Rand Air Tools have contributed to the advances in welding, especially by improving the preparation and finishing operations.

Improve and speed up your welding and satisfy your welders with I-R CHIPPING HAMMERS for peening, beveling, root chipping, cleaning off excess metal... GRINDERS for cleaning, smoothing, polishing, wire brushing... SCALERS for cleaning, removing excess metal and spatter... DRILLS for studding... AIR HOISTS for handling heavy weldments.

In most instances our branch offices can fill your order from their stocks—call them on the phone and start using I-R Air Tools today.

Ingersoll-Rand

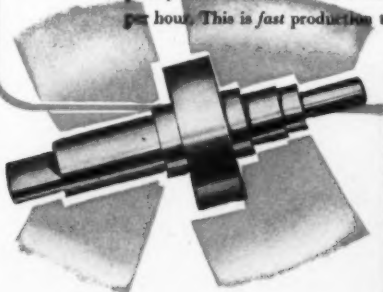
11 BROADWAY, NEW YORK 4, N. Y.

8-764

8 operations in 4 seconds

The part is a brass pinion blank, one inch long, $\frac{3}{8}$ " diameter.

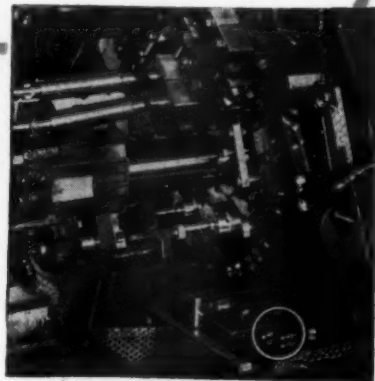
The eight operations include shaving six diameters for fine concentricity, and milling flats on large end. The entire job is completely finished in 4 seconds machine time—900 finished parts per hour. This is fast production time.



National Acme offers you something more than a series of production machines.

Improved methods of tooling and handling parts are important factors by which Acme-Gridley 4, 6 and 8 spindle automatics are making new cost-reduction records in hundreds of mass production shops.

This they accomplish by reducing machine time—a vital consideration when



both raw material costs and hourly wage rates are at high levels.

Write us about possible time-saving improvements in your own shop.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

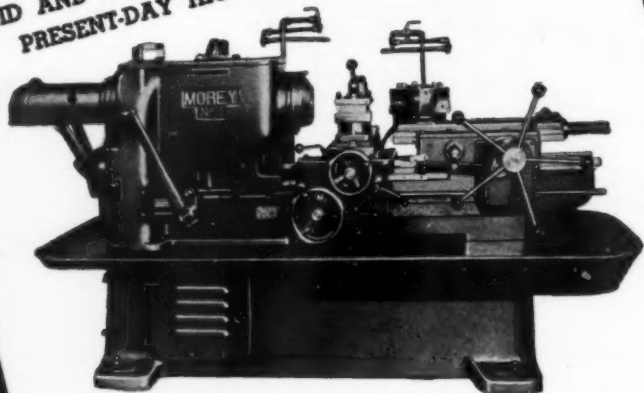
Acme-Gridley Bar and Chucking Automatics:
1-4-6 and 8 Spindles • Hydraulic Thread
Rolling Machines • Automatic Threading Dies
and Taps • The Chroming • Limit Motor Starter
and Control Station Switches • Solenoids
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MOREY *Universal* TURRET LATHES

for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!
EASY TO OPERATE • ACCURATE • DEPENDABLE
RIGID AND POWERFUL ENOUGH TO FULLY UTILIZE
PRESENT-DAY HIGHSPEED CARBIDE TOOLS



#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length, 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM,
constant speed motor, 1200 RPM

MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity
ASK FOR DESCRIPTIVE BULLETIN

STOCK DELIVERY

DESIGNED AND BUILT BY

MOREY MACHINERY CO., INC.

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PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK



for **TOUGH**
Drilling—

USE *Glenszer*
Eject or Lock
Utility DRIVER
for

STRAIGHT SHANK TOOLS

Extra clamping action on drill shank for extra tough going. A quick twist of the nut to right ejects driver and drill — to left locks driver and new drill in position.

Quick and Positive

Use Eject or Lock Drivers where machine or work interferes with use of a drift. No lost time — no damage to machine or tools through unskilled use of drift by inexperienced or careless operators.

Made in same size ranges as Regular Glenszer Utility Sleeves and can be furnished with shallow or deep holes for interchangeability with Regular Sleeves when used in multiple.

Send for folders Aa and Ab.

THE J. C. **G L E N Z E R** CO., Inc.

6465 EPWORTH BLVD.

DETROIT 10, MICH.

*Do You
Want to...*

- ➡ REDUCE REJECTS TO NIL?
- ➡ INCREASE OUTPUT 10-1?
- ➡ ELIMINATE EXPENSIVE TOOLING?

This IS THE MACHINE THAT CAN DO IT!
PORTER-CABLE
Wet-Belt Surfacers

THE proof is in performance! Here are some actual production records set by the **PORTER-CABLE WET-BELT SURFACER:**

On one job, rejects which formerly ran 20%-25% of production were reduced to only 2 in 18 months!

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On work requiring limits of plus .001", minus nothing, the operator faced two parts before another man had finished locking one up in a jig for milling!

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Write for complete production details and actual case histories of its use on many different machining jobs.

**PORTER-CABLE
MACHINE CO.**
300-4 Exchange St.
SYRACUSE 8,
NEW YORK

Featured In This Issue

OPERATION OF ENGINE LATHES, by The Shell Oil Company. In this, the first of several parts dealing with the operation and use of engine lathes, the parts of a lathe that hold the workpiece and control its motion, or rotating speed, are discussed. This material is reprinted by special permission of the Shell Oil Company. Page135

USING CARBIDES IN METALWORKING, by H. A. Frommelt. If you think your present equipment is not designed for the use of carbides this article, and others to come, will point out how present equipment can be converted to carbide milling. In this series of articles Mr. Frommelt will use actual case histories of jobs which have been successfully carbide milled using equipment which had been thought too light for the use of carbides. Page147

STOP THAT NOISE, by Francis A. Westbrook. Sound conditioning in machine shops is helpful in reducing worker fatigue and thereby increasing production. On painstakingly careful work the absence of noise will decrease the reject rate. Actual installations are discussed in a down-to-earth style. Page..161

MULTIPLE TOOL HOLDER ATTACHED TO SHAPER SOLVES MACHINING PROBLEMS, by Gerhardt P. Niesel and Herbert R. Steidtmann. In use at the Magnaflux Company is one of very few multiple tool holders attached to shapers. This company was forced to design such a tool holder to overcome a machining problem. The use and construction of the multiple tool holder is discussed in detail by the designers and builders of the tool. Page185

MODERN CENTERLESS GRINDING PRACTICE, by D. E. Lower is the third of a four part series dealing with centerless grinding methods. In this installment Mr. Lower discusses the proper selection of grinding wheels as well as stressing the necessity for plenty of coolants. A fairly comprehensive table of grinding wheel recommendations for specific jobs and materials is included. Page.....199

THE USE OF AIR GAGES IN QUALITY CONTROL, by Frank W. Blanchette. Some of

the advantages of the use of air gages in quality control are stated by a specialist. Included in this article are applications and some sampling methods. Page214

PRECISION MEASUREMENT, by Warren Baker. Part 10 of this series continues the discussion of instrument inspection emphasizing the Sine Bar and its uses in inspection. Page229

EFFICIENT TOOLING INCREASES PRODUCTION OF SOLEPLATES, by James R. Logan. General Mills produce 3,500 electric irons a day by using mass production polishing and buffing techniques. Their polishing and buffing operations are described in detail on Page242

LETTER FROM ENGLAND. Page.....246

CHEMICAL FINISHES APPLIED TO METALS describes one process of preventing rust and corrosion. The oxidizing method is described in detail. Recommended practices, principles, problems and a few words of caution are given. Page.....254

USE OF BETATRON IN INDUSTRIAL RADIOGRAPHY, by Jack T. Wilson. The use of this 20,000,000 volt X-ray machine has many industrial applications some of which are authoritatively discussed in this article. Page261

NEWS OF THE INDUSTRY. Page.....269

SHOP HINTS. Page276

WHAT'S NEW IN METALWORKING. Page284

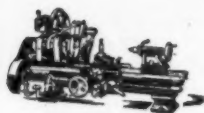
NEW TECHNICAL BOOKS. Page.....355

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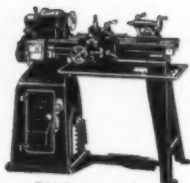
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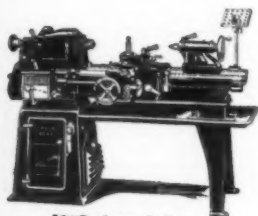
9" Bench Lathe



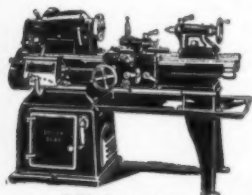
10" Bench Lathe



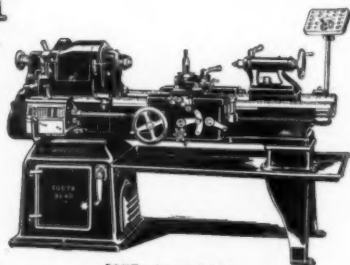
10" Engine Lathe



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As the **editor**

SEES IT

AN ENGINEER'S HOLIDAY

The idea of spreading our products out upon the earth and crying our wares is as old as the ruins of Babylon, and except for a shift in products — from carpets to machines — and a mutation of names — from bazaar to exposition — a fundamental purpose of the market place is still to bring the seller and buyer face to face, whether this be over a carpet, a barrel or a machine tool.

For today's engineer, however, exhibitions are more than a conclave of merchants. At exhibitions the engineer meets the customers and can calculate their responses to latest designs and improvements, and can analyze their buying motives. Thus, indirectly, conventions have sponsored many developments which without its stimuli of convention visitors' reactions would have remained a blank piece of tracing paper on a drawing board.

At exhibitions the engineer, by masquerading as an idling spectator, can cup his ear to a sales talk extolling his competitor's product. While not entirely erasing his low opinion of the competitor's brain child, he may take some of its more challenging advantages to heart.

By means of technical sessions, as well as through visual evidence of machines and materials on the exhibition floor, the latest materials and manufacturing methods are brought to his attention. When properly applied these can increase production, decrease costs or improve the general appearance of his product.

Exhibitions, further, exert a social force upon engineers. They can clap old friends on the back, meet men of their chosen profession and talk shop with Jim Smith from Peoria or Joe Brown from Houston.

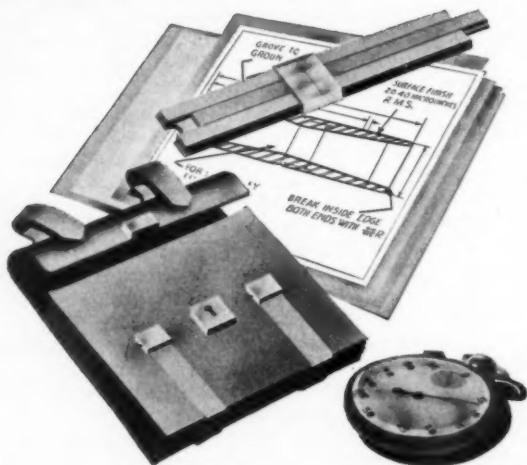
One of the largest of all industrial exhibitions ever to be held will be sponsored by the National Machine Tool Builders Association . . . the National Machine Tool Show to be held in Chicago, September 17-26. At this mammoth exhibition of machines, materials and accessories engineers will meet enough customers and old friends . . . will stumble across a sufficient number of new ideas and developments . . . will learn enough about his competitor's product to last him for quite a while. Attendance at the Machine Tool Show is a must for engineers.

William F. Schleicher

A BUYING GUIDE FOR ABRASIVES

Point No. 3

ABRASIVE ENGINEERING

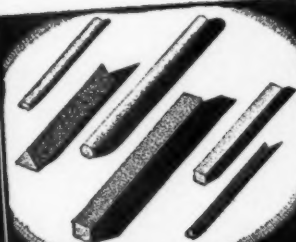


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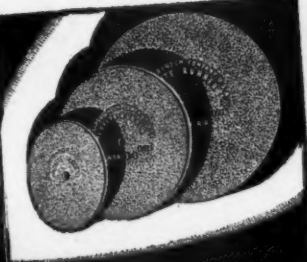
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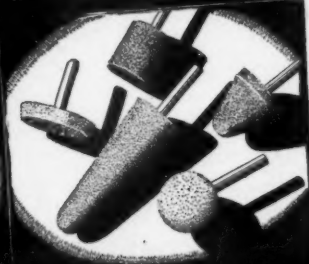
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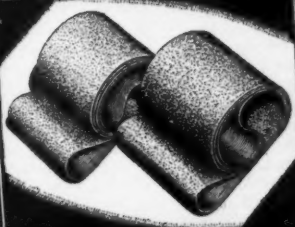
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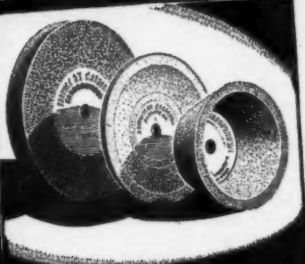
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OPERATION OF AN ENGINE LATHE



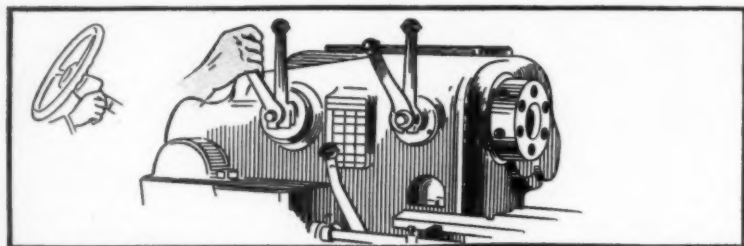
In 1946, the Shell Oil Company published an excellent book entitled, "Changing the Shape of Metals with an Engine Lathe." This book is a part of an overall campaign by the Shell Oil Company to acquaint industry with the most efficient uses of the tools of its trade. With permission of the Shell Oil Company, the MACHINE and TOOL BLUE BOOK is very happy to present to its readers some of the material

which appeared in this book.

To those of our readers who are already well acquainted with the efficient operation of engine lathes, this series of articles may serve as a refresher course, while the newcomer to the trade will, we hope, find the techniques here discussed helpful toward a better understanding of the operation of engine lathes.

THE PARTS OF A LATHE THAT HOLD THE WORKPIECE AND CONTROL ITS MOTION, OR ROTATING SPEED

The headstock of a lathe is the unit that embodies the spindle, a series of gears (or pulleys) by which the spindle is rotated at various speeds, and where gears are used, it also embodies the control levers for selecting the speed desired.



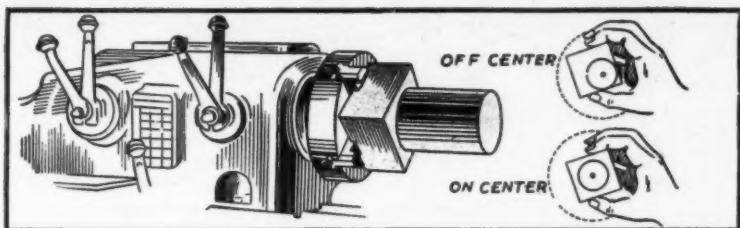
It is the spindle that rotates the workpiece so the tool can cut on its surface. However, the greater the diameter of the workpiece, the faster is its surface speed per spindle revolution. Thus, in order to attain a given surface speed, the spindle must be rotated slower in the case of large diameter workpieces and faster for workpieces of small diameter. This variation in spindle speed is easily accomplished by the adjustment of one or more control levers. If driven by a cone pulley, speed changes are made by shifting the driving belt to a pulley of larger or smaller diameter.

There are many reasons why differ-

ent workpiece surface speeds are necessary. The hardness of the metal, the type of tool used, the size of the chip being cut, the finish desired, etc., are some of the factors that have a bearing on what speed is the most desirable for a given result. All these factors will be discussed in detail in the text which follows, at the point where their significance is most likely to be accepted and remembered. The most important factor to be remembered at this time is that different spindle speeds are necessary and are easily attained. . . . In most modern lathes, an index plate attached to the headstock shows graphically the lever positions necessary to get any spindle speed desired.

• • •

A 4-jaw or Independent chuck has four jaws that can be adjusted independently of each other. Thus, by adjustment of the jaws, a workpiece of either cylindrical, square or irregular contour can be held so the section to be worked is located "on center."



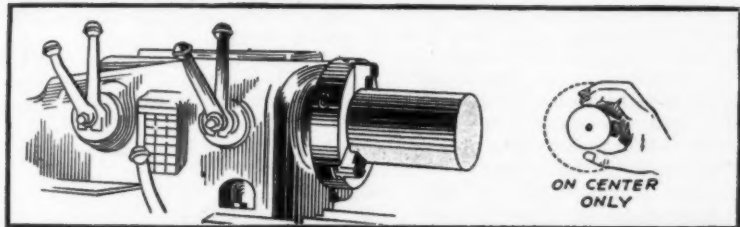
The jaws of a 4-jaw chuck are located and move in four equally spaced channels that lead to the center. Thus, the workpiece is gripped on four sides and, regardless of its shape or the relative position of the jaws, adequate gripping pressure is possible. The face of the chuck is scribed with concentric circles which serve as guides when chucking cylindrical pieces in approximate center position. Accurate centering in all cases must then be done by individual jaw adjustment.

By the use of a 4-jaw chuck, a higher degree of centering accuracy can be attained than is possible with a 3-jaw chuck, but more time is required for

the centering operation. All 4-jaw chucks are of the same basic construction, but vary in size. Naturally, larger size chucks should be used for chucking large and heavy workpieces. The chuck is mounted on, and is rotated by, the spindle. The method of mounting a chuck on the spindle varies in lathes of different construction. Some are screwed on the spindle nose. Some are bolted to a spindle plate. Some are held by pins and cams. Still others are provided with a tapered shank which fits into the tapered hole in the spindle nose. But in all cases, the mounting of a chuck on a spindle is not difficult, regardless of type.

• • •

A 3-jaw or Universal chuck is so called because all three jaws are simultaneously moved an equal distance toward or away from the center, by turning a chuck key. Thereby, the workpiece is automatically brought to an on-center position.



Although a 3-jaw chuck theoretically holds the workpiece in an on-center position, slight deviation is possible due

to wear in the gear mechanism, or because of misuse. Because of this fact, 3-jaw chucks are generally used where

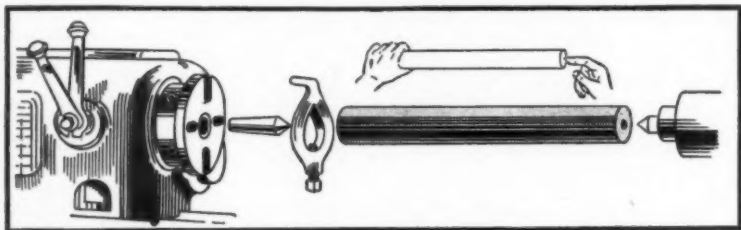
the depth of the cut to be taken is great enough to offset such possible deviations.

It should be borne in mind that, because a 3-jaw chuck has one less jaw, and because its jaws cannot be made to grip as tightly as a 4-jaw chuck, relatively long or heavy pieces cannot be gripped as securely as with a 4-jaw

chuck. However, a chucking operation can be performed in less time with a 3-jaw chuck. It is sometimes referred to as a scroll chuck, due to the fact that it contains an internal geared scroll.

Combination chucks (though not illustrated here) combine the automatic on-center advantage of 3-jaw chucks and the individual jaw adjustment advantages of 4-jaw chucks.

By the use of a live center, dog, and driving plate, a workpiece may be supported at its "left" end, and rotated. The live center fits into a tapered hole in the workpiece. The dog is clamped onto the workpiece and the driving plate rotates the dog.



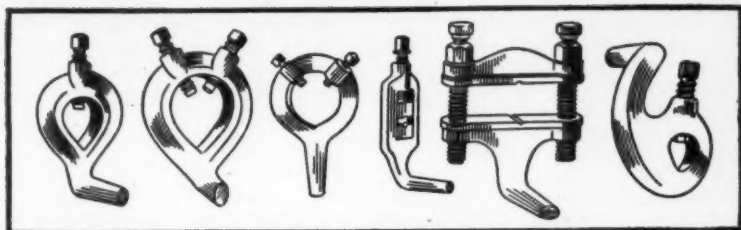
When a workpiece is supported at its "left" end by a live center, it is also supported at its "right" end by a dead center. The center holes, into which these centers fit, establish the center line or axis upon which the workpiece rotates. Because the holes in the workpiece and the points of the centers are formed with the same included angles (60°) the same center-line position is always attained, no matter how often a workpiece is removed and remounted.

The importance of remounting a workpiece to its original on-center position is apparent when it is remembered that every operation must be performed in relation to the same center line. Any

variation from the originally established center line will result in a corresponding variation in subsequent cuts, and, as a result, the relationship between dimensions cannot be maintained. This is particularly important when a succession of operations demands that the workpiece be transferred from one machine to another, which is something that is almost impossible to accomplish when a workpiece is chucked.

Absolute centering accuracy demands that both the centers and the center holes have the same included angle, (60°) and that the spindle holes be free of chips or metal particles when the centers are seated.

Lathe dogs are made in various sizes and designs in order to permit selection of the one most suitable for a workpiece of given dimension and shape.

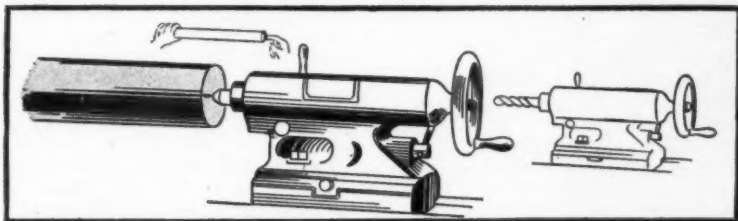


The function of a lathe dog is to transmit the rotating motion of the driving plate to the workpiece. Therefore, it must grip the workpiece firmly enough to withstand the cutting pressure of the tool. For cylindrical workpieces, dogs with round or heart-shaped openings are generally used. These have one or more set screws which seat the workpiece securely. The type with a square opening is used to grip workpieces that have a flat surface.

When selecting a dog, one with an

opening only slightly larger than the diameter of the workpiece is preferable. A dog provided with a bent tail should be located as close to the end of the workpiece as possible, so the tail can ride securely in the slot of the driving plate. When this cannot be done, a stud long enough to reach to the dogtail is inserted in the driving plate. If, on the other hand, a workpiece is too large in diameter to permit the use of a dog, a hole may be drilled and tapped in its face, into which a stud is inserted, long enough to engage the driving plate slot.

The tailstock is movable on the bed and supports an adjustable spindle which normally holds the dead center. Thus, by tailstock movement and spindle adjustment, the dead center is brought into position to support the "right" end of a workpiece.



The importance of longitudinal tailstock movement and spindle adjustment is clear when it is remembered that the live center is held in a fixed position. It is the range of tailstock movement that makes it possible to hold workpieces of different lengths between centers. And it is the range of spindle

movement, after the tailstock is clamped in a given position, that makes it possible to mount and dismount workpieces of approximately the same length. Because the tailstock spindle does not rotate, it may also be used to hold taper-shanked tools — drills, reamers, etc. In this event the work-

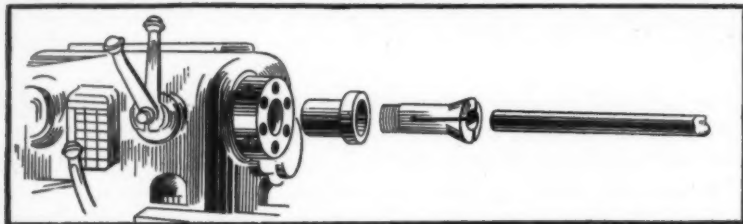
piece is chucked, and is rotated by the headstock spindle. The tool is advanced into the workpiece by turning the hand wheel.

It should be remembered that because the dead center does not rotate with the workpiece, as does the live center, it acts as a bearing upon which the workpiece rotates and must, therefore, be well lubricated at all times. Any expansion in the workpiece due to heat generated by the cutting action of the tool should be compensated for by backing off the dead center. This is done by turning the hand wheel, thus

relieving the pressure, which should never be greater than that required to hold the workpiece securely. All dead centers are made of tempered steel; some are provided with tungsten alloy tips, for longer life.

The upper part of a tailstock may be moved crosswise on its base. This throws the dead center out of alignment with live center. When this is done, the workpiece supported between the centers is cut to a tapered form as the tool is moved longitudinally by the carriage.

A draw-in collet chuck has a hollow, split, and tapered head, which grips small diameter workpieces and bar stock. When this head is drawn into its closing sleeve, the workpiece is automatically gripped on all sides and held in an on-center position.



Collets come in sets, with openings of various sizes and shapes. They are interchangeable. The collet selected for a given workpiece must have an opening that conforms with the size and shape of the workpiece, whether round, square, hexagon, or octagon. Its gripping action is brought about by turning a hand wheel attached to the threaded drawbar. This drawbar extends through the hollow spindle, and screws onto the collet. When it is tightened, the workpiece is gripped; when loosened, it is released.

Another advantage of the collet chuck is that its entire assembly is hollow—the collet, closing sleeve, draw-in bar, and hand wheel. Therefore, long pieces

of bar stock can be fed through it. As the machining of each succeeding part is completed and cut off, the collet grip may be released, the bar moved forward, and again be chucked accurately and quickly.

Whenever bar stock is handled in this manner, however, the end that extends out from the headstock must be supported by a length of pipe, or by ring standards to prevent whipping.

The range of material dimensions that a given collet can effectively accommodate, should not vary over approximately .015 above or below the designated collet size. To assure chucking accuracy, all matching surfaces must be clean and free of chips.



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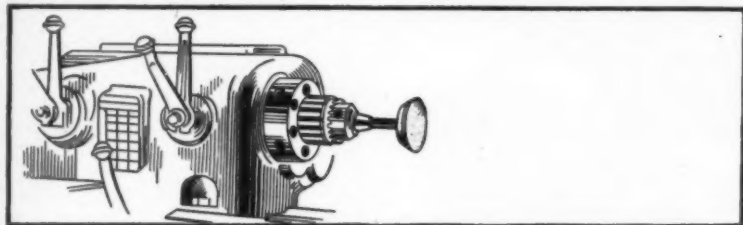
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A headstock spindle chuck is similar in principle and action to the chuck in an ordinary electric hand drill. It is mounted on the nose of the driving spindle, and its jaws are adjusted by means of a pinion key.

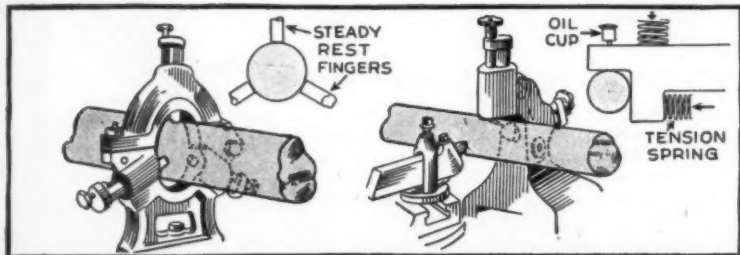


This type of chuck is most frequently used when turning workpieces of small diameter, or when polishing small machined parts. It is seldom made in a size capable of accommodating material over 3/4 inches in diameter. As a rule, it is hollow, so bar stock can be fed to it through the hollow headstock spindle. However, it may also be used to hold straight shanked tools, such as center drills, reamers, or countersinks.

Another type of spindle chuck is provided with a tapered shank that will fit into either the "live" headstock spindle which rotates, or in the "dead" tail-

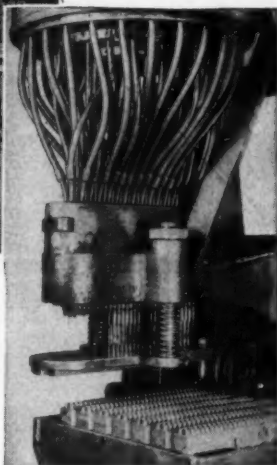
stock spindle which does not. It can only be used for chucking short workpieces or relatively small tools, such as countersinks, drills, etc. Not being hollow, it cannot accommodate a long shanked tool or length of bar stock. When a milling attachment is used to hold the workpiece for a milling operation, a spindle chuck may be employed to hold the milling cutter, in which event the chuck is mounted in the headstock spindle. Such chucks are quickly and easily mounted and dismounted. They are more accurate, as a general rule, than a 3-jaw, but not as accurate as a collet chuck.

A steady rest supports the workpiece from all sides and is attached to the lathe bed. A follow rest supports the workpiece opposite to and above the tool. It is attached to the carriage, and, therefore, is moved as the tool is moved.





Closeup of spindles grouped for drilling castings with 62 parts each, spaced 5/16". All 62 ports are drilled at one time. Drill sizes are Nos. 30 to 49. Total parts, 434. Drilling time: 4 minutes.



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A relatively long, slender workpiece, being turned between centers, must be supported against the pressure of the cutting tool. This support is provided by a steady rest, a follow rest, or both. On the other hand, a relatively long workpiece, that is chucked, also needs support at its outer end, in which event a steady rest is employed. Both these devices have adjustable supporting fingers to accommodate variations in workpiece diameter.

There are three possible sources of trouble when a workpiece is supported between centers, that may be eliminated

by the use of a steady rest or follow rest: (1) The workpiece may "whip" because of high rotating speed, which will cause the tool to "chatter" and a wavy finish to be produced. (2) The workpiece may vibrate, because the metal is tough, or because too deep a cut is being taken, or because the tool being used has too wide a cutting area. In all cases, an unsatisfactory finish will be produced. (3) The workpiece may bend and back away from the tool, thereby impairing cutting accuracy. All these troubles can be avoided by a properly adjusted steady rest or follow rest, or both.

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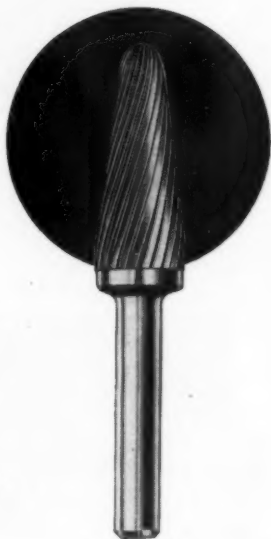


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Using Carbides in Millwork



Described is the procedure used to mill a steel component 2" x 4" x 20" using a milling machine which had been considered too light for carbide milling.

by
H. A. FROMMELT
Consulting
Engineer

THIS SERIES of articles on milling with carbides is an attempt to discuss frankly, sincerely and earnestly with production personnel and management, economic and production aspects of carbide tooling. These discussions will proceed solely on the basis of proven, daily, shop-contact and shop-produced facts. The advantages as well as the disadvantages will be considered using actual operations for illustrations. These presen-

tations will concentrate on carbide milling, the most difficult of all the metal removing processes when sintered carbide tools are used.

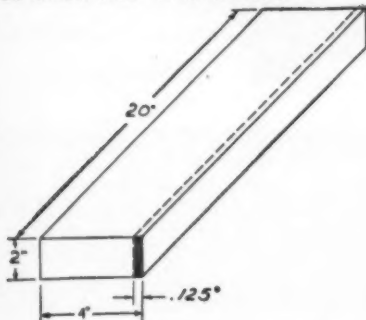
MILLING SAE 1040 STEEL BAR FOR MACHINE TOOL BASE

Fig. 1, presents a perspective of bar of SAE 1040 material intended as a component in a machine tool. The bar is 2" thick, 4" wide and 20" long. First, the worst of all the milling operations is to be performed, truing up the narrow side, as indicated in the line perspective. Approximately .125" must be removed to properly straighten out the 2" side required by the blue print.

The operation is being performed on a twelve-year old, 7.5 hp knee type machine—a number 3 (See Fig. 2). This piece of equipment of noble lineage served valiantly during the war.

Since this is a 1040 material, the specification of the SFM rate—and this is the first step in any carbide milling job—follows the standard procedure, namely, choosing the surface rate on the basis of the Brinell hardness and only on this basis. It is essential in all carbide milling operations that the Brinell number be known or definitely ascertained within reasonable limits of accuracy. The following table is, therefore, applicable:

Fig. 1. The steel component part to be milled. .125" is to be removed.



BRINELL HARDNESS

OF STEEL	SFM
160—180	624—593
180—220	593—536
220—300	536—447
300—420	447—338

Since this steel component has a BHN of 220 the SFM rate should be in the neighborhood of 536.

A 6" diameter cutter is selected for this job since it has 50% more blades than a 4" cutter which would have been sufficiently large, obviously, to cover this narrow face. But here is an operation which will reflect itself in cutter life. The more blades and carbides that can be brought into contact with the workpiece to remove a given number of cubic inches of material, the less wear on each. This No. 3 knee type machine has no flywheel, as is characteristic of all standard equipment; hence it is well to compromise in some other feature of the operating set-up to compensate for this. The 6" cutter must travel farther—or rather the table must do so—thus, more time is consumed with the larger cutter. But this is negligible in comparison to the smaller amount of down-time on the equipment. Since this is a reasonably active production operation the consideration of downtime is important. The comparison between the 4" and 6" cutters, as regards cutter life will be revealed later.

At 536 SFM, and using a 6" cutter, the rpm of the spindle will be 343, the nearest dial reading is 300, on the low side, and hence the SFM rate is altered to 468. A ten per cent variation in the SFM rate either way is considered within the bounds of good practice; here the variation is slightly more, but the lower reading on the speed dial was chosen because of the general condition of the machine and the thought that at the lower spindle speed there might be less distress evidenced in the equipment. As results were produced, this

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- ▶ Ample power is provided for almost any milling operation by a special geared-down motor.
- ▶ 18 feed changes for $1\frac{1}{2}''$ to $54''$ per minute make adjustment to any cutting speed simple and quick. An optional feed range from $3''$ to $108''$ is available.
- ▶ In addition to indexing and rotary milling, the usefulness of the Rotary Table is further widened by its adaptability to many other jobs where an automatic revolving fixture would save time and costly manhours.

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judgment was confirmed.

The 6 blades of solid carbide, held in a cutter body mechanically by means of wedges, as indicated in Fig. 3, are ground with the following cutting and clearance angles:

- 7 degrees negative radial rake;
- 7 degrees negative axial rake
- 15 degrees nose angle
- 7 degrees clearance on the periphery, or OD
- 7 degrees clearance on the face cutting edge angle.

Note, first that only one angle is ground into the OD. It is no longer necessary to grind both a secondary and a primary. Grind the one angle of 7 degrees to the edge without leaving a land. The use of a land is antiquated practice, except in very unusual instances—and these will be referred to and discussed in later discussions—and is the result of the necessary practices and techniques of years gone by and the application of the older and weaker cutting materials. Second, the use of a 7 degree face relief angle is also revolutionary

and needs explanation, not justification, since it is based on proven experience. The older face relief angles of 2 and 5 degrees when milling steel were necessary with the cutting metals than in use; now, with the fully developed carbides these relief angles can be increased—in fact must be increased for optimum cutter life.

The grade of carbide to be selected and designated for an operation should follow faithfully the recommendations of the carbide manufacturer. Obviously, a steel cutting grade will be applied for this operation. Since these types of carbides have different physicals, choose the strongest for this operation. Because of the condition and design of the machine it is the wiser part of production planning to designate a steel cutting grade of carbide boasting of its strength rather than its wear resistant characteristics. If it is impossible to have both, choose the stronger carbide and sacrifice something in carbide wear. Such carbide blades will wear more readily

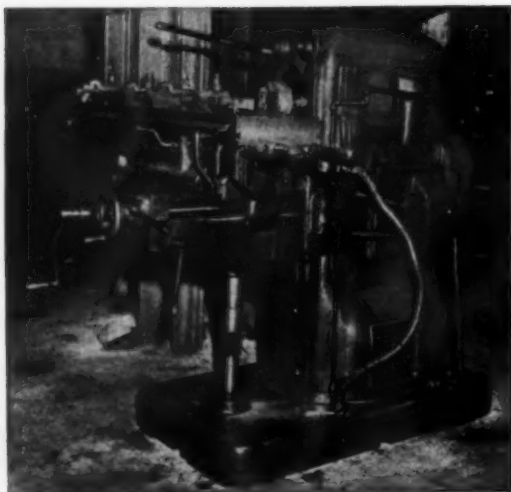
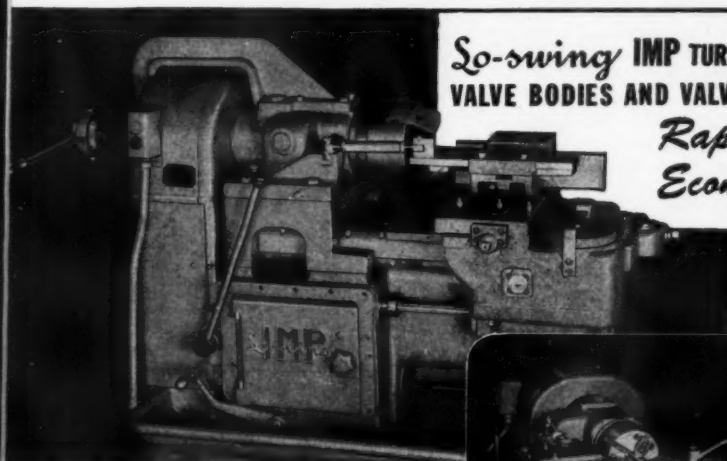


Fig. 2. The machine used to perform the carbide milling operation. This is a much-used model which saw considerable service during the war. It was considered impractical for this particular carbide milling operation. However, final results established that this, and similar machines, could advantageously be converted to carbide milling.

MACHINE OF THE MONTH

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**Lo-swing IMP TURNS AND FACES
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Problem: To taper bore and back face the Valve Body and taper turn the Valve Key.

Solution: Lo-swing IMP Lathes were selected for both operations because its spindle bearings permit high spindle speeds required for turning bronze alloy and its carriage design assures unusual turning accuracy and provides protection for the ways of the bed which are completely covered at all times.

Illustration above shows the equipment for taper boring the Valve Body and facing the small end. The boring bar is controlled by an adjustable template clearly shown in the illustration. The piece is rough bored with a coarse feed on the forward stroke and finish bored with a fine feed on the return stroke. The cross slide cam automatically feeds in the tool .005" on the return stroke. The end facing operation is made with a special tool holder located in the head-stock spindle bore. The operation consists of clamping the pieces in the chuck, the operator then pulls the starting lever and the facing tool lever, after which the rest of the operation is entirely automatic.

Close-up illustration at right shows the equipment for taper turning the Valve Key. The turning tool in this operation is also controlled with an adjust-



able taper template and the key is rough turned on the forward stroke and finish turned on the return stroke by the same method employed for the boring of the Valve Body. The operation consists of loading the piece between centers and pulling starting lever, the remainder of the operation is entirely automatic.

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LATHE NEWS from SENECA FALLS

but at the same time will more effectively resist the pounding they will be subjected to in this type of operation.

In carbide machining, after the surface rates and cutter diameter have been established, the next step is establishing the metal removal rate possible for this operation, considering both the nature and design of the workpiece (thin sections, etc), and the size (hp) and condition of the machine.

To estimate the metal removal rate justified by the work-piece requires experience and is largely the result of common-sense application. In this operation, a series of runs were made at four different feed rates to establish factually the removal rate. These will be detailed directly.

The steel bar, 2" by 4" by 20" long, mounted in an ideal set-up, could "take" a removal rate of 50 cubic inches per minute on this narrow side. Obviously, the machine will determine the rate possible in this operation. The limitation of 7.5 horse power is to be considered and applied and, second, the condition of the machine itself and the limitations that this in turn imposes on the normal rating of the machine's motor.

First, it was decided that not more than 5 of the horse power in this equipment would be used. Second, a K factor of .75 was agreed upon—and later verified—for this operation. The K factor for the same material on satisfactory carbide milling machinery would be .5 and less. (The K factor is the power required to remove one cubic inch of material each minute; hence a K factor of .5 means that one-half horse power will be required to move one cubic inch of material).

Limiting the power to 5 and applying a K factor of .75 it will be possible, with this equipment to move 6.7 cubic inches of this steel bar each minute.

If the sectional area of the cut (See Fig. 1) is $\frac{1}{4}$ times 2, or $\frac{1}{4}$ square inches, then the feed rate to move 6.7 cu. in./min will be 6.7 divided by $\frac{1}{4}$, or approxi-

mately 27 inches per minute.

Since this machine had never before been operated at a feed rate of 27", and because of mental hazards plaguing management, it was agreed to "creep up" on this rate. Note, however, that the planning approach is by the conservative route: Only 5 of the 7.5 hp would be used and a K factor 50% larger than necessary would be applied. Still, the feed rate of 27" is indicated.

The first run, or rather series of runs, was made at an ipm of 12; the second at 16; the third at 20 and the fourth finally at 26.

The vital statistics for these runs are:

	1st RUN	2nd RUN	3rd RUN	4th RUN
Feed, ipm	12	16	20	26
Chip Load	.067"	.009"	.011"	.014"
Cu. In./Min				
Metal Removed	3	4	5	6.5
H. P.	2.4	3	3.75	4.8

For all of these the machine gave a

• • •

Fig. 3. A 6" diameter cutter was selected because it has 50% more blades than a 4" cutter. The more blades which can be brought into play on an operation, the more material can be removed and the less will be the cutter wear.





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good account of itself and evidenced no distress. The gross meter reading for power confirmed the judgment of a K factor of .75, which is correct except for the first run, and here it is .8, which is to be expected at this low partial loading of the equipment.

All of the chip loads are satisfactory; those for the ipm rates of 20" and 26", particularly good. And this is confirmed by the excellent cutter life obtained at these feed rates.

Cutter life considerations are interesting: with carbide not more than 300 of these sides can be milled between grinds. This comes close to 10,000 square inches. Usually for this class of material the number of square inches removed is 20,000 or more. The limitation is in the machine—no flywheel to smooth out the impact blows with each tooth entrance. The tooth pitch is 3" plus, and since the workpiece face width to be milled is 2" only one blade or carbide tip is in contact with the work at any one time. Hence each tooth entrance results in an impact blow on the carbide blade that reduces its life. The reason for the choice of the stronger carbide steel cutting grade is revealed.

Tool or cutter life with H.S. steel is still more interesting. Both past records and confirming runs indicated that not more than 100 of these 2" by 20" faces could be milled between grinds. Hence the downtime on the machine is reduced to one-third or by as much as 65%. This is a considerable item where 300 of these pieces (milled on one side as shown) are scheduled for one 8-hour shift. With carbide the downtime is 15 minutes each period; with the older cutting material it is 45 minutes. The production of one-half hour is saved or gained by the application of carbide.

The cutter re-conditioning costs are still more revealing: For carbide the time to re-grind and re-set the 6 blades is ½ hour; for H.S. steel it is 1½ hours. The cost of the carbide blade per piece milled is .1 cent, for H.S. steel .5 cents

per piece of face milled.

Fig. 2 presents the machine used for this operation. Maintenance costs are difficult to estimate. The opinion of the maintenance department to-date is this: "It requires approximately twice as much time to keep the machine in adjustment, gibs, bearings etc., with carbide tooling than before; that is, these adjustments are now made twice as often as before." The additional cost, according to management's estimate, is however, so small as to be negligible. No major repairs have been necessary in one year of carbide operation.

Resume

It is possible to use not only standard equipment but standard equipment that, by all yardsticks of evaluation, has taken a severe beating during the war. No major repairs were made and no gingerbread was added by way of flywheels on the spindle, etc. This latter, however, could have been done at a total cost of \$50.00. A carbide milling machine will, however, take the place of this equipment.

It will be interesting under this resume to estimate the possibilities of a machine designed for carbide milling. The equipment specified is of the size of approximately a No. 3 but has a 20 hp motor on the spindle and 2½ hp on the table drive. The built-in flywheel smooths out the flow of power to the cutter and the electrical brakes reduce the maintenance costs and headaches that would otherwise plague management, especially with a flywheel to add to the energy that must be absorbed by the system. Above all, this contemplated piece of equipment will have a separate table drive motor and will eliminate the difficulties arising from overloaded spindles and stalled cutters.

Briefly, and by way of conclusion: 20 hp means at .5 K factor that 40 cubic inches can be moved each minute on a machine no larger than the one now used and shown in Fig. 2. This makes

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possible milling four of these faces at one time, or a width of 8" and a sectional area of 1 square inch. Thus, at 40 cu. in./min rate of removal 40 ipm will be the feed rate. A 6" diameter cutter with 6 blades will be carrying a chip or tooth load of .020", all to the good from the point of "life."

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The Sundstrand Machine Tool Co. of Rockford, Ill. has added a new Model 16 Automatic Lathe to their present line of lathes. The new lathe is larger in capacity than their present Model 8, 10 and 12 but embodies most of the basic design features.

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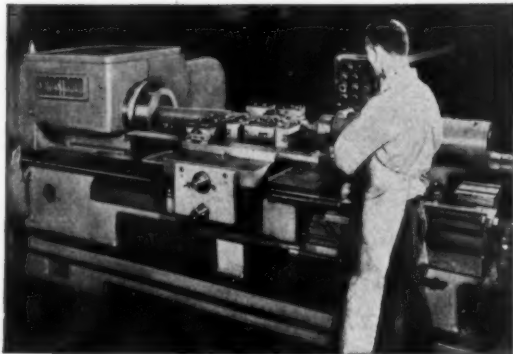
The quick cycle changeover makes it possible to multiple tool this lathe for short runs as well as for production turning. It can be used for either shaft turning jobs or chucking work. The ample horsepower makes it practical to use multiple tooling and carbide cutting tools.

Both the spindle and front carriage drive units are provided with two different driving gear centers. In each case, this feature provides an increased range between high and low spindle speeds and high and low front carriage feeds. In addition, the number of speeds and feeds obtained from one set of gears are both doubled.

Complete control of all cycles is provided by adjustment of dogs on a cycle control disk. Making cams for cycle control is thereby eliminated. Changing position of dogs on disk changes lengths of rapid approach, feed and rapid return strokes. This simplifies cycle setup and changing from one turning job to another.

Pendant control is provided for ease of operation in turning large work. The entire machine cycle is controlled thru push buttons. A power operated tailstock is provided for speed and convenience in

Finally, this operation was tentatively experimented with on the above equipment with the following results: Cutter life doubled, cutter re-conditioning costs halved, or .05 cents per piece and the downtime of the machine halved or one change in two eight-hour periods.



loading heavy work pieces. Automatic de-clutching between spindle and spindle motor with self-adjusting magnetic brake for quick stopping of spindle rotation is also provided.

The rear carriage is adjustable full length between headstock and tailstock centers. Screw feed is provided to the front carriage. The rear carriage and tailstock are provided with rack and pinion adjustment.

For additional information write Sundstrand Machine Tool Co., Rockford, Ill., Dept. BB.

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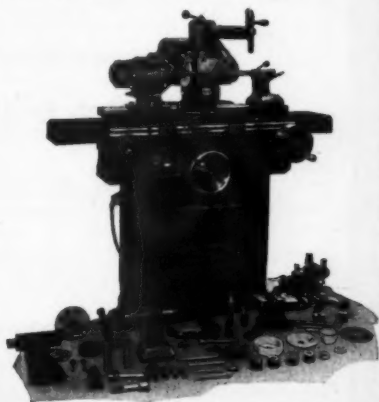
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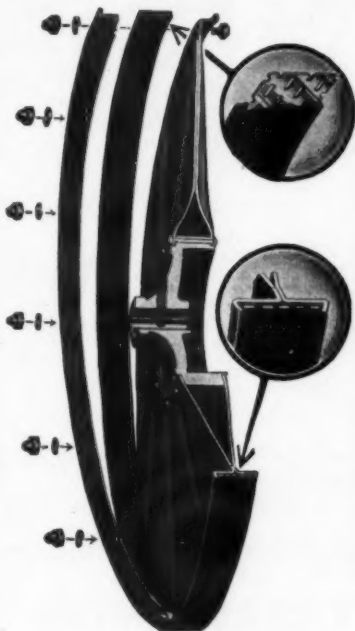
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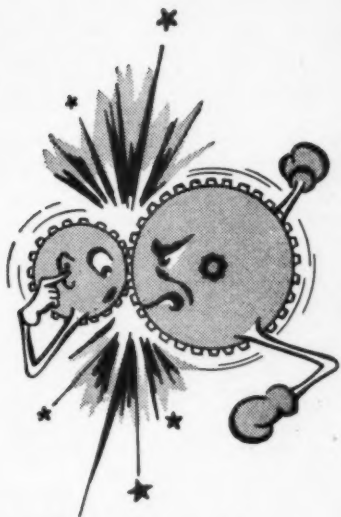
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STOP *That* NOISE



Factory noises affect the productivity, accident rate, fatigue and general welfare of workers. In this article several case histories of sound conditioning installations are cited. Some general observations on noise and the methods used to reduce the deleterious effects of noise are discussed.

By Francis A. Westbrook

The installation of sound conditioning expanded rapidly in machine shops during the war because it was essential to remove every possible deterrent to worker output; that the advantages were real and immediate was strikingly shown by the number of working areas which were treated. Consideration of a few specific jobs will show how fatigue was reduced and worker output increased in ratio to correspond to the amount and extent of sound conditioning.

Among these is the Voges Manufac-

turing Company, Ozone Park, N. Y., builders of machinery for use in the plastics industry. The plant consists of two machine shops, not adjoining, and a plastic shop. In the latter are located hydraulic presses giving forth an irritating hum when in operation which would be excessive without acoustical treatment.

The machine shops house engine and turret lathes, milling machines, grinders, drilling machines, etc. which were used during the war primarily for the manufacture of precision parts for aircraft engines. This work required close tolerances, and careful concentration by the operators.

The buildings were erected during the war. To provide for as high a degree of efficiency as practicable, it was decided

to install acoustical ceilings to reduce the noise, at the same time improve working conditions. The management did not wait to find out whether there would be enough noise to influence productivity but proceeded on the basis of known experience to create the best conditions it could, within reason.

Perforated fibrous tile, Acousti-Celotex Type C-8, 24 inches wide by 48 inches long and 1 inch thick was used. This was attached to 1 inch thick by 3 inch wide wooden furring strips nailed to the ceiling joists, a very simple procedure. (This tile may be painted repeatedly by ordinary methods without damaging its sound absorbing properties.) See Fig. 1.

The illustration indicates how the white acoustical ceiling enhances the

• • •

Fig. 1. Machine Shop with Acoustical Ceiling. Working conditions are improved and worker efficiency was raised as a result of the installation.



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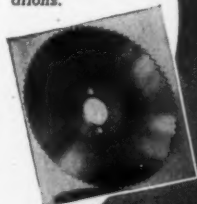
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Segmental type blades in large sizes (as above) and solid type blades in smaller sizes (as below), but all the well known advantages of the Triple-Chip Method in both types "all the way up and down".

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appearance of the room; it further reflects the fluorescent lighting very effectively. That the working conditions in these acoustically treated shops are good is attested by the fact that the labor turn-over and absenteeism have been negligible, and that there have never been any complaints about noise. There is, of course, some noise but this is never excessive. The offices were also provided with acoustical ceilings. Altogether some 20,000 square feet of the sound absorbing tile was used.

The excellent working conditions provided by the management in the form of sound conditioning, fluorescent lighting and wood block floors, etc., did much to offset the nerve racking pres-

sure of war work, and played their part toward realizing maximum production. Obviously, these benefits continue in peacetime and will have an important bearing on keeping the lid down on costs under the competitive conditions which are certain to become more troublesome in days to come.

Another installation for the abatement of noise was made at the Pulverizing Machinery Company, Summit, New Jersey, in several areas of its plant and offices, conference room, telephone booth, main office, the sheet metal and welding shop and the test grinding department. Sound conditioning work was undertaken after it was decided that noise was excessive. Since the installa-

• • •
Fig. 2. Test Grinding Department of Pulverizing Machinery Company with Ceiling and Part of Wall Acoustically Treated. Offices, cafeteria, conference room and telephone booths were also sound conditioned. Note that the acoustical tile also covers a portion of the side wall.

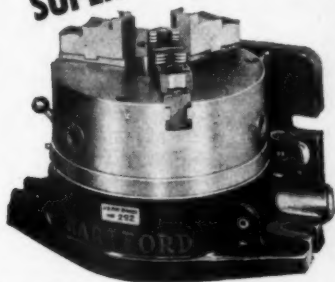


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tion the management has reported a marked improvement in conditions. See Fig. 2.

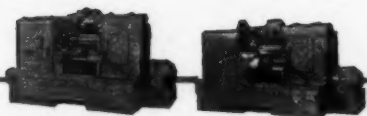
In the test grinding department approximately 1000 square feet of Acousti-Celotex tile, type C-8, 24" x 24" x 1 inch thick, having a noise reduction coefficient of 70%, was installed part way down the side walls, as shown in Fig. 2. A similar amount of a smaller size tile, 12 inches by 12 inches by 3/4 inches thick, known as type C-9, was used for the ceiling. Approximately 7000 square feet were installed in the offices, 2000 square feet in the conference room and 75 square feet in the telephone booth.

The walls and ceilings were furred with wooden furring strips on to which the acoustical tile was nailed. The installation was accomplished without interruption of the normal use of these areas.

Treatment was applied in the sheet metal and welding shop at a later date. In these installations the tile was cemented directly to the ceiling and part way down the side walls.

Application of the acoustical tile part way down the side walls by this company is interesting. It is not always necessary but where the room is small, the volume of noise high and of high frequency, an acoustical ceiling alone is not always enough because the reflection of noise from the walls tends to build up to an annoying pitch. Where work, involving close mental application, is carried on, as in this plant, treatment of the walls is often well worth while.

When sound conditioning was installed by J. R. Woods & Sons, Inc., New York, in one of its manufacturing departments, a primary consideration was the close concentration and mental effort required to perform close precision machining operations. The management had found that the noise from machinery was fatiguing to work-



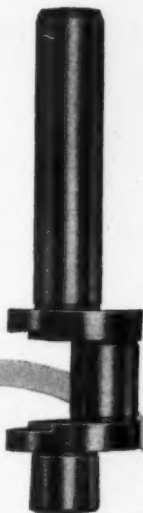
**2 MACHINES
INSTEAD OF 4**

IN machining the crankshaft illustrated, the accepted procedure is to cut bar stock to length on a cut-off machine, and perform the remaining relatively slow, costly operations on three chucks.

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Fig. 3. Small Machine Shop with Ceiling of Acoustical Tile. Considerable machine development work is carried on in this department. Noise was reduced to a minimum, achieving highest output.

ers on critically close work and decided to reduce fatigue as much as possible. An acoustical ceiling was installed, consisting of a mineral tile (Acousti-Celotex Mineral Tile type M-2) having a noise reduction coefficient of 70%. It

was cemented directly to the existing ceiling. See Fig. 3.

Another space acoustically treated by this company was a small machine shop where many of its own tools are manufactured. In this room they have the



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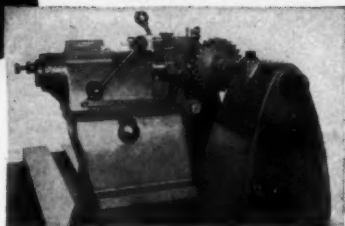
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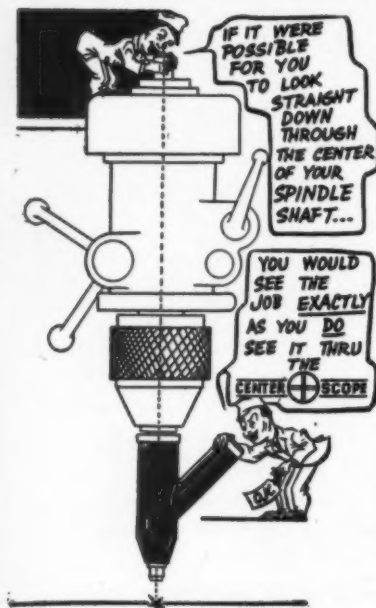
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usual machine shop equipment; lathes, drill presses, grinders, shapers and milling machines. Much of the work consists of designing and developing production equipment. This calls for concentrated study and thought by highly skilled workers. Because the room is small, noises build up and become very annoying; consequently, the management felt that anything which would reduce distraction due to this noise would result in better work and increased production. It was decided to install an acoustical ceiling by cementing tile to the existing ceiling. In this connection it must be remembered that, generally speaking, the more highly skilled the workers are, the more susceptible their nervous systems are to the ill effects of noise.

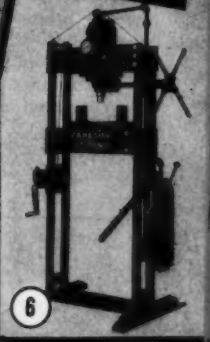
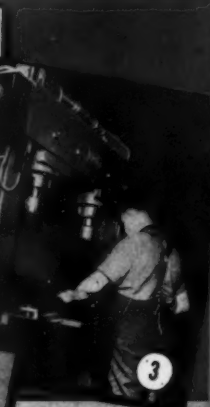
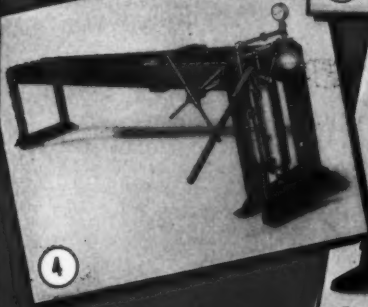
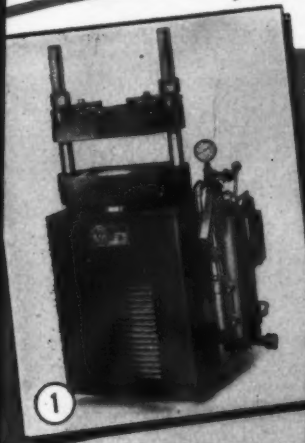
In addition to the above acoustical treatments, approximately 4500 square feet of tile was used for the ceilings of various offices. The lowering of fatigue and increased production due to sound conditioning has justified the expense of the installation.

The Roller Bearing Co. of America, Trenton, New Jersey, installed sound conditioning in the riveting room of a new plant which it occupied during the war. At that time the War Production Board would not permit the erection of any new plant east of the Allegheny Mountains because of the danger of bombing from enemy aircraft carriers. As a result, the company was forced to take over a building originally intended for a warehouse, the construction of which was sheet metal protected inside and out with sheet asbestos. For this reason it was imperative to install ceilings over the working areas to keep out dirt, heat etc. See Fig. 4.

The area which was sound conditioned was also air conditioned to prevent dirt from getting into the finished products. In all cases, noise was really a secondary consideration, except in the riveting assembly department where noise caused by high speed hammers

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Fig. 4. In this riveting department, where a larger percentage of workers are women, noise was reduced to eliminate nervous fatigue. Quality of the work increased as noise decreased.

• • •

was of prime importance. Girls are employed for this work and, as is generally conceded, are more susceptible to noise than men, the need of acoustical treatment was of first importance. See Fig. 4.

Operating this equipment caused high nerve fatigue among the employees

which the sound conditioning materially reduced. Consequently, the management feels that the sound conditioning installation was justified. The actual installation consisted of 2520 square feet of perforated fibrous tile 1½ inches thick nailed to wooden furring strips on the ceiling.

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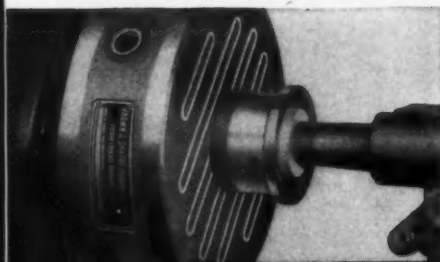
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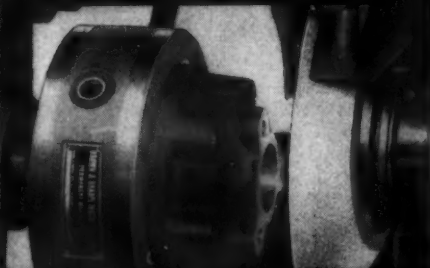
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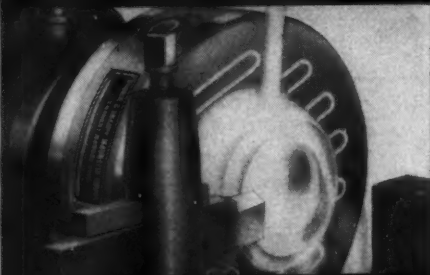
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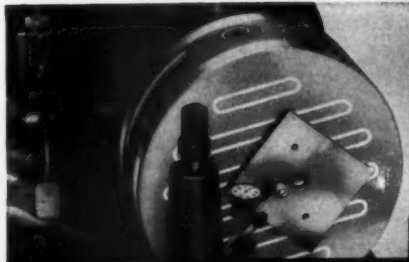
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	2	3	4	5	6	7	8	9	10	12	14	16	18	20	
The Average Ear Experiences These Percents of Loudness Reduction															
40	17	24	31	37	43	48	53	58	63	71	77	82	87	90	
50	13	19	25	32	38	43	47	52	56	63	69	75	80	84	
60	12	18	24	29	34	38	42	46	50	56	62	69	73	78	
70	12	17	22	26	30	34	38	42	45	52	58	64	68	72	
80	15	21	27	33	38	42	47	50	54	59	64	67	71	75	
90	15	22	28	34	39	44	48	52	55	62	67	72	76	79	
100	16	23	30	35	40	44	49	53	57	63	69	74	77	81	
110	16	24	30	36	41	46	51	55	59	66	71	75	79	82	
120	17	25	32	38	43	48	53	58	61	68	73	77	81	84	
130	17	24	31	37	42	47	52	56	60	67	73	77	81	84	

Source: American Standards Association and Acoustical Society of America

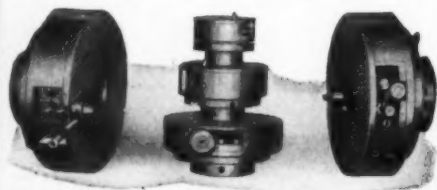
TABLE I

• • •

Another advantage of the acoustical ceiling, was the providing of heat insulation. This consideration is not usually primary among those given weight when deciding upon the desirability of sound conditioning, but there are cases where it is of importance. Actually, the acoustical tile is as efficient a heat insulator as standard insulating board; therefore, when the acoustically treated space is on the top floor or in a one story building the sound absorbing tile affords heat insulation against the outside summer sun and against heat loss from the inside in winter.

Naturally, this would not apply where the acoustical ceiling is not directly below the roof.

The variety of details taken into consideration in the aforementioned acoustical treatments show how necessary it is to analyze each installation as a separate problem before taking action. The shape of the space, source and character of the noise, and the amount of noise reduction sought, must be duly taken into consideration. The sound conditioning engineer who knows the sound absorption characteristics of the materials in the space and how much



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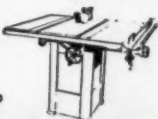
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the noise levels can profitably be lowered, can calculate how much absorption is needed for a satisfactory result.

The decibel system for measuring noise quantitatively provides a partial means of measuring human reactions to sounds of varying intensities. Loudness depends on intensity and the sensation of loudness follows a logarithmic law with respect to physical intensity. Sound at the "threshold of hearing" is rated at zero decibels and at the "threshold of feeling," where it is loud enough to begin to cause pain, is 120 to 130 decibels, or some 10 trillion times its intensity at the "threshold of hearing."

An idea of the actual meaning of decibel values may be gained by considering a few familiar sounds and their loudness expressed in decibel units.

noise at such levels is likely to make itself felt in the form of fatigue, decreased efficiency, impaired hearing, nervous indigestion, emotional disturbances and neuroses. Another matter of importance is that the psychological effect of different kinds of noise such as high frequency, suddenness, monotony, confusion, etc. is not necessarily dependent on decibel values.

A noise meter, calibrated in decibels, has been devised by acoustical engineers. This is used to measure the noise levels of different machines individually, or the overall noise levels of manufacturing spaces. It is also used to measure noise levels before and after acoustical treatment.

This brings up a very interesting and practical fact determined by experimental research and accepted as standard

Whispering,	20 to 35 decibels,
Average conversation,	55 to 65 decibels,
Noisy office or average factory,	60 to 80 decibels,
Riveting, grinding, sawing, printing presses, etc.	95 to 140 decibels,
Punch press,	95 to 105 decibels,
Automatic screw machines,	90 to 100 decibels.

The physiological danger zone varies considerably with the individual, but, on the average, begins at around 90 decibels. It is important to bear in mind that the ill effects of noise are often cumulative. For example, even if pain is not felt at 90 decibels, or thereabouts, long continued exposure to

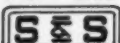
by acoustical engineers: a reduction in noise level of only a few decibels will have the effect on the ear of a much greater reduction. Table I, prepared by the Acoustical Society of America, shows this relationship.

Reference was made in the case of the

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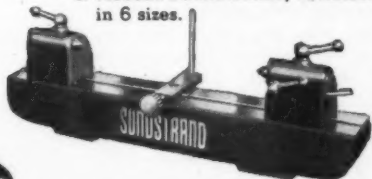
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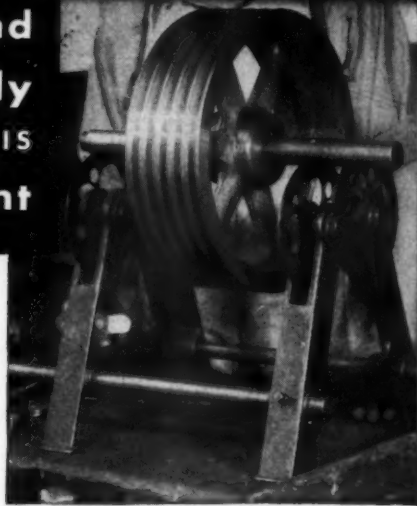
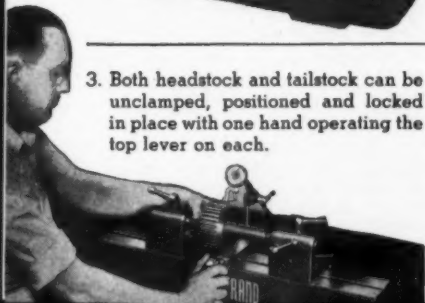


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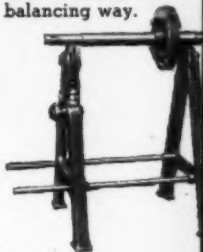


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Pulverizing Machinery Co. to the application of acoustical tile part way down the side walls to abate the cumulation of noise by reflection. This is extremely important and still another instance where decibel values alone do not necessarily tell the entire story. In his paper entitled, "The Problem of Industrial Noise", presented before the National Hygiene Section of the American Public Health Association in New York in Oct. 1943, Paul E. Sabine, Ph.D, says, "Analysis of the comments of workers in plants that have been acoustically treated disclosed that two elements, partly psychological and partly objective, contribute to the 'noisiness' of a worker's environment.

"The first is reverberation, or the prolongation of a sound by repeated reflection from highly reflecting wall surfaces, ceilings, sometimes machinery, etc. In a reverberant space the worker has the sensation of working in a noisy environment. Replacing the reflecting surfaces by absorbing surfaces reduces the environmental factor, thus markedly reducing the annoyance, even tho the measured noise level is not greatly decreased.

"The second element is the so-called 'spreading effect' of sound. In an open space the intensity of sound from a given source falls off rapidly as the distance increases. In reverberant rooms the sound intensity from a single source is almost independent of the distance from the source—that is, it spreads with little diminution with distance. As absorbant treatment greatly reduces this spreading effect, the man working at a noisy machine has the feeling of a relatively quiet surrounding. That workers recognize this effect is attested by their comments on conditions before and after acoustical treatment, such as, 'The noise of that machine over there stays where it belongs', or 'Before, it seemed like every machine in the plant was making noise. Now I can hear only



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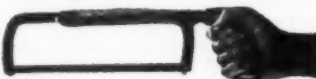
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the ones right around me."

From these considerations it is easy to see that sound conditioning can be an important factor in the safety program, as the distracting effect and nervous wear and tear of noise are quite likely to result in an inattentive attitude leading, eventually, to an accident. Continuous noise may also blanket sounds which warn of the approach of danger.

In view of the comparative ease with which sound conditioning may be installed, and the beneficial results which are being obtained over a wide range of conditions in industry, it would appear that a progressive management could hardly afford to overlook the problem of noise and its abatement. In comparison with the benefits which may often be realized the cost of acoustical treatment involves an outlay which usually returns a handsome dividend. The reliable manufacturers of the acoustical tile, or other absorbent materials, know what to do and it is important to make use of the good ones.

(Photos courtesy of Jacobson & Co., New York)

LAPORTE BROACH INSTRUCTION MANUAL

The LaPointe Machine Tool Company, manufacturers of broaches and broaching machines, recently completed a 124-page instruction manual. The book contains descriptive data plus instructions for the installation, operation, servicing, and maintenance of all the LaPointe standard broaching machines.

This information is supplemented by tables of specifications and drawings of the hydraulic and electrical circuits of each machine, when idle and in various stages of operation. One section is devoted to the LaPointe hydraulic pumps and important data concerning hydraulic oil. In addition, it contains excellent diagrammatic sketches and photographs of the hydraulic pumps. Other features are the LaPointe vertical hydraulic press and the LaPointe universal broach sharpener. These instructions likewise are supplemented by tables of specifications and photographs.

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To improve penetration at the start of a bead, the "Arc Booster" of this new welder can be set to dig in with deep penetration. This is especially important for tack welds and short beads.



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The welder has a reactor type of control which is a free circuit, designed for high responsiveness to changing arc conditions. It is separate from the main transformer which is designed for high efficiency. This design gives high arc sensitivity for maximum ease and speed of welding under all conditions; it makes possible an exceptionally wide range of output; and it improves power efficiency.

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The open circuit voltage of the "Fleet-Arc" AC welders never exceeds 63 to 70 volts (depending on welder capacity). This eliminates the hazards of the high open circuit voltages which are used in the usual AC welders to improve arc striking.

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The independent control circuit eliminates the need for high open circuit voltage, contributes to higher power factor. By reducing amount of condensers needed as much as 66%, this new welder minimizes idle power input.

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USE OF COLOR IN INDUSTRY

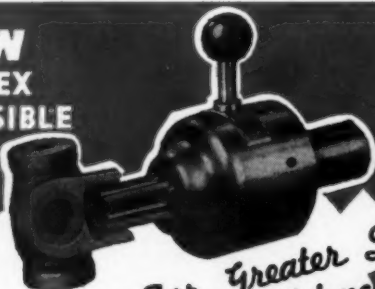
Color engineers have achieved considerable success in showing that the intelligent use of paint has significance in industry other than for the basic functions of protection and decoration. After an intensive survey of 46 plants made by the Pittsburgh Plate Glass Co., the research gained was put to practical use. It was found that from the beginning, the application of color helped increase quantity and quality of production, reduced accidents, cut absenteeism, and raised morale through the scientific use of its natural psychological, symbolic, and visual effect.

The importance of color as an additional productive force was difficult to convince to practical, old-line production men, surrounded by heavy-duty machinery. It was brought out in the survey that color was used for identification of material and equipment; it speeded production by the adoption of color codes; some plants had previously employed color as identification symbols, but the ramifications of its

modern use can be classed as an industrial innovation. Another factor was the use of color to create the illusion of minimizing the effect of weight or bulk, and changing the apparent physical proportions of a working area; it was even proved that the apparent temperature of a working area was changed by the painting of the walls.

The physical characteristics of color, the qualities by which it can be classified as brilliant or dull, strong or weak, was used for inducing orderliness and cleanliness in the working area, as well as reducing eyestrain, bodily fatigue, eliminating specific safety hazards, and cutting down on illumination maintenance costs. The aim of the survey was to establish the general trends and accomplishments of scientific color use. It covered widely divergent types of industrial and manufacturing activities. Included were aircraft and automotive factories, and electronic devices, to textile producers and food and drug preparation.

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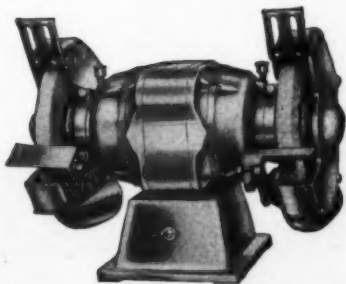


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Multiple Tool Holder Attached to Shaper Solves Machining Problem

by

Gerhardt P. Niesel,

Shop Foreman, and

Herbert R. Steidtmann,

Plant Superintendent, The Magnaflux Corporation.

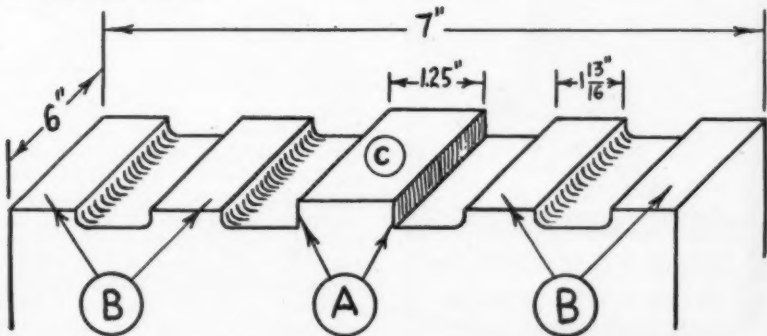
ONE OF THE component parts which are used in a Magnaflux magnetic testing unit is a movable tailstock. This tailstock is usually a bronze casting, although several times in the past we have used grey castings. The only major machining operation on this casting is in the machining of the surfaces which rest on the bed of the testing unit on which the tailstock slides back and forth. The center, raised surface of the bearing part of the tailstock (C, Fig. 1), fits into a keyway on the bed of the testing unit, thus holding the tailstock rigid. The remaining 4 surfaces (B, Fig. 1) rest firmly and solidly on the

slideway of the bed of the unit. The tailstock must be easily movable over the bed of the testing unit without excessive play. The overall machined surface of the tailstock casting measures 7" wide x 6" deep. Four bearing surfaces are $\frac{13}{16}$ ", the center is 1.25".

The operations to be performed on this casting consists of machining the four surfaces (B) and machining the sides of the center surface (A). It was on these machining operations that we encountered a problem that was solved by a designing and manufacturing of a multiple tool holder. This multiple tool holder we attached to a shaper.

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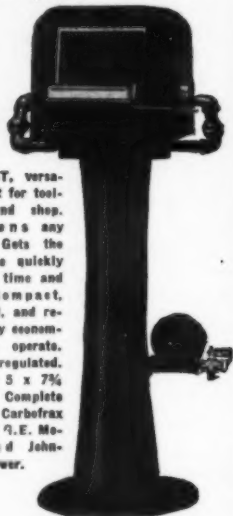
Fig. 1. A drawing of the surfaces of the casting which is machined on a shaper, using a multiple tool holder.



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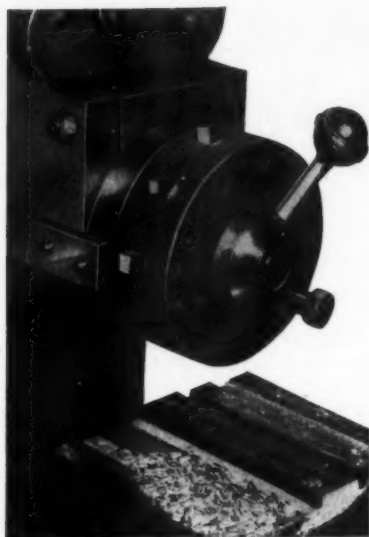


Fig. 2. Three tools are shown inserted in the multiple tool holder. More tools can be inserted, if the job requires more than three cutting operations, by simply providing additional tool holes. The tailstock is shown mounted in a fixture.

Note that the index pin has been partially withdrawn, to permit the holder to be rotated. In Fig. 5 the index pin is in operating position, locking the holder in place for the cutting operation.

• • •

Previously this casting was machined on a light-duty horizontal miller. But production was far below our requirements and manufacturing costs of the tailstock soared out of sight. One casting was machined every 1½ to 2 hours; further, after milling 1½ casting, the cutter had to be sharpened. Thus, when the time consumed in sharpening the cutter was added to the actual milling time, it can be appreciated that costs for this particular machining operation were a little higher than the low production

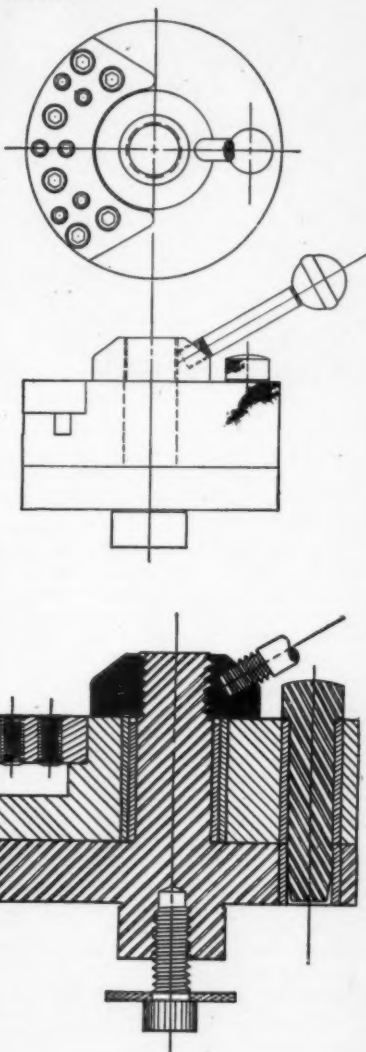
rate warranted. We further experienced not only short tool life, but considerable tool replacement cost. In the absence of a heavy-duty vertical miller, which would have solved this machining problem, we switched the operation onto a shaper in an effort to increase production and reduce the tool cost. While tool life was lengthened and tool costs sharply cut, overall manufacturing costs were not beneficially affected because of the setup time and machining time required; thus, a shaper proved equally unsatisfactory.

We realized that if we could combine the advantages of milling, that is, perform the operation in one setup, with the advantages of a shaper and its attending benefits of long tool life and low tool cost, the problem would be on the way to being solved.

Construction of Tool Holder

Unfortunately, a multiple tool holder for use on a shaper and which would

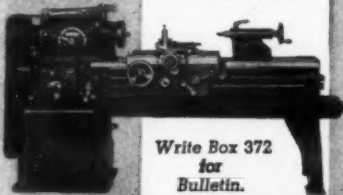
Fig. 3. Blueprint of the multiple tool holder.



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Fig. 4. Mr. Steidtmann, left, and Mr. Niesel are examining the parts of the multiple tool holder. Mr. Steidtmann is pointing to the hub, which is attached to the clapper bar. The tool holder turns on this hub, and is held in place by the clamping nut and handle, which are clearly visible, lying between the tool holder on the right and the indexing pin on the left.

eliminate setup time when used on a shaper was not available in the market. It was decided to design and then manufacture a multiple tool holder to meet our exact needs.

The multiple tool holder, the final outcome of our designs, is shown in Fig. 2, attached to the shaper and performing the surfacing operation for which it was designed. A blueprint of the tool is shown in Fig. 3.

The construction and operation of the tool holder is simple. The individual tools are held in place by means of set screws on a revolving member. In the machining operation under consideration only three tools are required. However, it is possible to mount as many as five or six tools on the holder, depending, of course, on the job to be performed. The member which holds the cutting tools turns on a fixed hub which in turn is clamped onto the clapper bar of the shaper. In Fig. 4 Mr. Steidtmann is pointing to the fixed hub which is attached to the clapper box by screws.

The holder is indexed by means of a pin. In selecting the tool for use, the rotating member is freed by removing

the index pin and loosening the clamp nut. A handle is located in the clamp nut which turns the member, until the next tool lines up with the work. The index pin is then reinserted and the tool is ready for the next cutting operation. The tools are set up on the holder in such a way that by simply turning the member the next tool lines up with the operation. Thus setup time is reduced and it is possible to make but one setup for the entire operation. Fig. 4 shows the removable members of the multiple tool holder. The hub is shown clamped in position on the clapper bar, the rotating member with its tools projecting lies at the right of the picture, the index pin in the immediate foreground, while the clamping nut and handle lie between the revolving member and the indexing pin.

The Multiple Tool Holder in Use

To perform the surfacing operation on the bronze casting, it is necessary to machine two surfaces on the right of the center bar and two surfaces on the left of the center bar; further, the two vertical edges of the center bar have to be machined to size. Hence, three tools

are needed, one for the left surfaces, one for the right and one for the vertical edges of the centerpiece. As noted in Fig. 1 the edges of the center strip have to be at a 90° angle with the groove of the casting. While a minute radius is almost impossible to avoid, it has to be so minute that the angle appears to be almost perfect. In this connection it might be well to mention that on the previous method of machining, viz. with a milling machine, it was almost impossible to obtain a square corner which met our requirements.

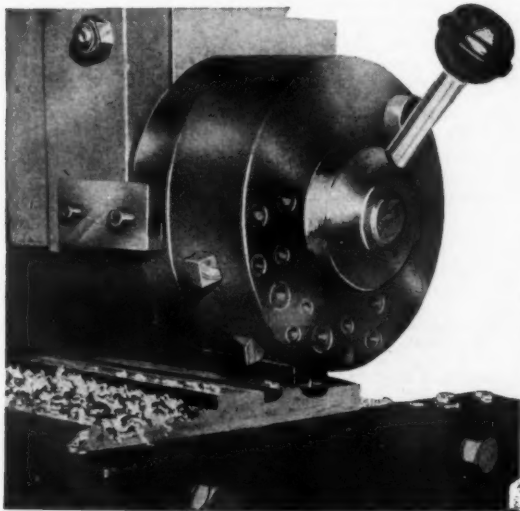
In performing the surfacing operation, 1/2" square single point carbide tools are used, using a side cutter for the side cutting operation. As soon as the two

right surfaces are surfaced, the operator removes the indexing pin and turns the handle for the next cutting operation. The indexing pin is then reinserted, locking the tool holder in place on the hub. This is repeated for as many cutting operations as are encountered in the operation, in this particular case, three. Fig. 5 shows the multiple tool holder in operation.

As will be seen from the above brief description, there is but one setup required for all three cutting operations.

The entire unit is attached to the clapper bar of a Rockford Hydraulic 24". Just enough play is left in the clapper to relieve the pressure on the carbide tips. The operator is using a feed

• • •
Fig. 5. The right hand surfaces of the bronze casting are being machined. The left side and vertical center edges have been machined. After completion of each cutting operation, the holder is moved, lining up the next tool. Only one set-up is made for all cutting operations.



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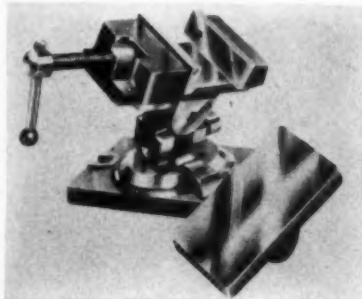
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At the present time we machine 30 castings before tools have to be changed and sharpened. This contrasts sharply with the 1½ castings we obtained previously before the cutter had to be sharpened. Each casting is machined in 20 minutes. When this is compared to our previous production of one casting in 1½—2 hours, the production increase, approximately 300%, is noteworthy. By and large, the initial cost of manufacturing the multiple tool holder has repaid itself hundreds of times, and we wouldn't be without it.

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individual, by large plants requiring several units, or by small manufacturing establishments. The vise is of aid in light milling, drilling, and grinding work, or on other small parts which present an awkward surface for working.

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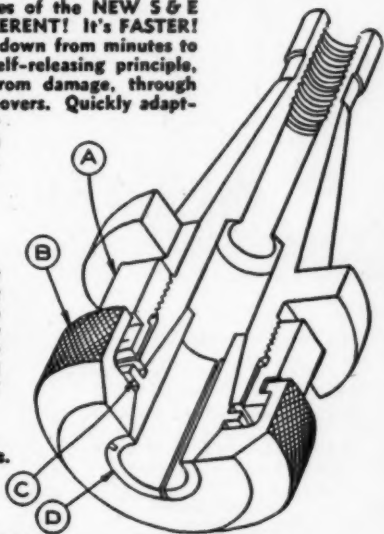
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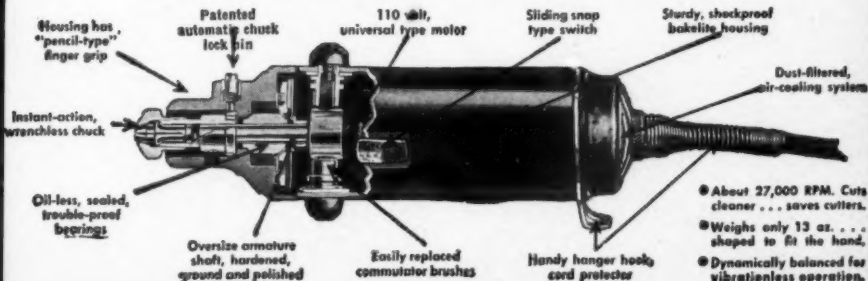
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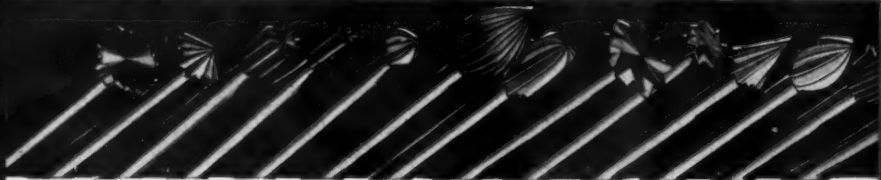


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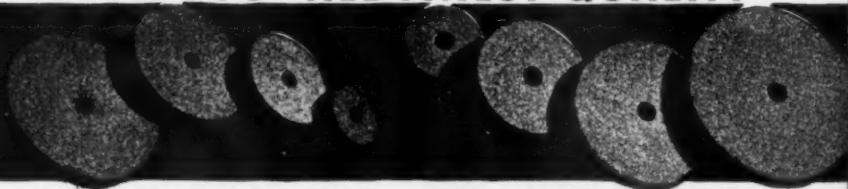
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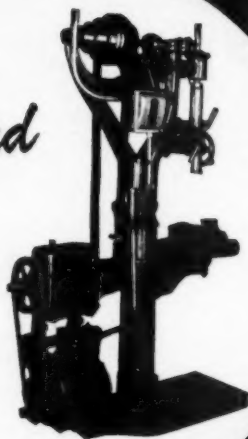
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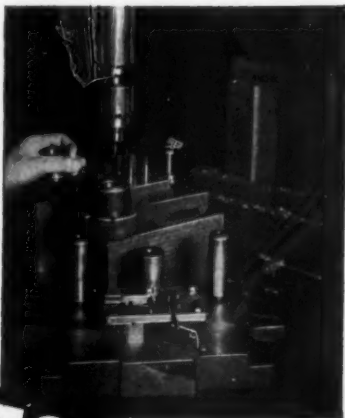
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MODERN CENTERLESS GRINDING PRACTICE



Part 3
Selecting the Right
Wheels and Coolants

By D. E. Lower,
Abrasive Engineer,
Simonds Abrasive
Company

Selecting exactly the right wheel for each job, to assure desired production, accuracy and surface quality is more important in centerless grinding than in cylindrical grinding between centers. In between-centers grinding a skilled operator can manipulate a wheel provided it is not too far removed from ideal specifications to give a close approximation of the ideal action. He realizes ideal action by changing the amount of feed and traverse and the relative speeds of work and wheel.

Such manipulation alters the cutting action of the wheel, but nearly always at the cost of production. To a lesser extent the same manipulation can take place in centerless grinding, but only at the expense of one of the important advantages of centerless grinding—high production. Centerless grinding is primarily a mass production operation.

Only by actual tests can the right wheel for each job be selected; if possible, these tests should be performed on the machine that will be used in actual production, using the correct feed, traverse and wheel speeds.

To avoid unnecessary tests every time the same job or a closely similar one is considered it is desirable to keep job records, listing all job conditions and results. It is recommended that all of the following items be recorded:

- 1—Name of part and part number,
- 2—Size, (diameter and length).
- 3—Material.
- 4—Amount of stock removed in each cut.
- 5—Finish required.
- 6—Type of grinding.
(Thrufeed, infeed or end-feed).
- 7—Traverse rate.
- 8—Grinding wheel speed.
- 9—Regulating wheel speed.
- 10—Regulating wheel angle.
- 11—Blade material.
- 12—Blade angle.
- 13—Height above centers.
- 14—Machine make, model and number.

15—Grinding wheel make.

16—Grinding wheel specifications.

17—Coolant used.

18—Production per hour.

If records are kept in such detail, they not only show which wheel is best, but are invaluable guides in setting up similar jobs.

The number of wheels that need be tested for each job can be greatly reduced by selecting the test wheels from the Table of Grinding Wheel Recommendations for Centerless Grinding which accompanies this article. It should not be assumed that the wheel here recommended for a specific job will necessarily be exactly the right one for the same job in your shop, for a wheel's performance is affected by such outside factors as the condition of the grinding machine, vibration conditions in the shop and the skill of the individual operator.

However, a wheel selected from this table will be of the correct type of abrasive, grain size and type of bond. The only factors likely to deviate from these recommendations are grade and structure. These should not be more than one or two degrees off from those of the wheel that will ultimately be found to give best performance in production, wheel life, surface finish and accuracy.

It is well for grinding foremen and machine operators to have some knowledge of what governs wheel action. Among other benefits, that knowledge will enable them to judge why and to what extent a wheel selected for test does not give exactly the performance desired, and so indicate which wheel to test next. Such knowledge will also assist the operator in making slight changes in speeds and feed when, in an emergency, it is necessary to grind a lot of parts with one of the only wheels immediately available, which may not be exactly the wheel that would be chosen if mass production were to be undertaken.

Here are the basic factors underlying



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wheel action:

1—A wheel should be "self-sharpening". That is, the abrasive and the bond should be such that the abrasive grains will be fractured or torn from the bond at the moment when the grains become too dull to cut efficiently. If the bond is too hard, the grains will be retained too long, and, unless they are of a type which fractures too easily for the job, will have a rubbing rather than a cutting action. With a soft bond the grains will be torn out before they have dulled and shortened wheel life will result.

3—The type of abrasive to use depends upon the physical characteristics of the material. For very hard, very soft, or very brittle materials the abrasive should be silicon carbide, which breaks down easily. Silicon carbide wheels are used for such materials as cast iron, cemented carbides, brass, bronze, aluminum, stainless steel, carbon and glass.

Aluminum oxide abrasive is used for those tough materials of high tensile strength which would break down the silicon carbide grains too soon. The majority of steels are ground with aluminum oxide wheels.

4—Vitrified bond wheels are used for the majority of centerless jobs. Resinoid wheels are used for certain special jobs such as parts made of case-hardened steel or very hard steel alloys where fine finishes are needed. Among these are ball finishing, special alloy steel bearing sleeves, drill rods, clock arbors, piston pin finishing, and clock balance staffs.

5—The grade, or bond hardness, to use depends upon the stresses set up in the wheel by the various elements of the grinding action. In general, bond hardness should increase with the magnitude of the stresses—but not to the point where the grains are held too long.

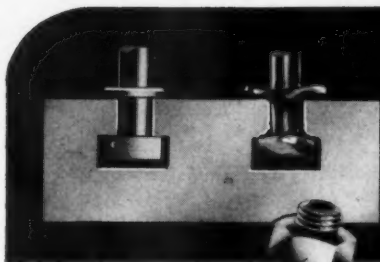
6—The depth of cut sets up both compression and shear. The important

consideration is their magnitude per unit of area of contact between grinding wheel and work. Since, for a given feed the total stress set up is practically uniform, the unit stress depends upon the area of contact. The greater the area, the less the unit stress, and the softer the bond, that can be used, and vice versa. The shorter the piece and the smaller its diameter, for in-feed and centerless grinding, the small-

• • •

In thrufeed grinding of long bars and tubes, a soft wheel may wear enough on one piece to cause taper. It is sometimes necessary to use a harder wheel on long pieces than would be suitable for short ones.





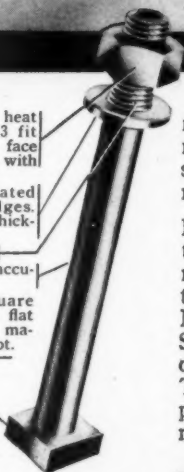
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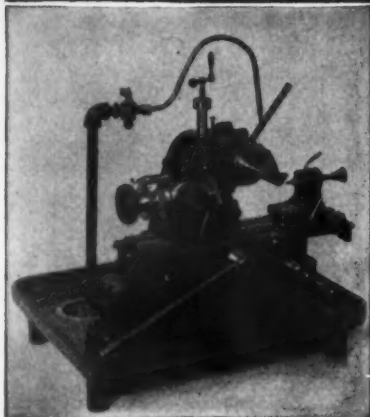
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er the area of contact and the quicker a given wheel will break down. Therefore, in infeed grinding small diameter work calls for harder grades than large diameter pieces. Also, because there are more fine abrasive grains per unit of area than coarse grains, the stress per grain decreases as the size of the grain decreases, and vice versa; thus, the size of grain can be increased for larger diameter work pieces. As a general rule, very small diameter pieces are usually ground to best advantage with wheels of 80 grain or finer. The ordinary run of work can be ground with a 60 grain wheel of aluminum oxide and a 36 grain wheel in silicon carbide.

While in infeed grinding, the longer the work piece the greater the area of contact, the effect of length on wheel action is so slight that ordinarily it will not effect the grade nor the grain size. However, work length should be considered in thrufeed grinding, for a wheel which will perform satisfactorily on short pieces may wear enough, when grinding long pieces, to produce a taper; therefore, it is generally better, when thrufeed grinding long bars or tubes to use harder wheels and finer grain sizes.

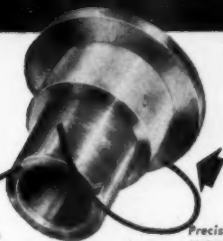
Infeed grinding often involves grinding close to a shoulder, which may tend to break down the corner of the wheel. To offset this, harder and finer wheels should be used.

To remove large amounts of stock with heavy cuts calls for coarse grained wheels or open structure, to allow for sufficient chip clearance.

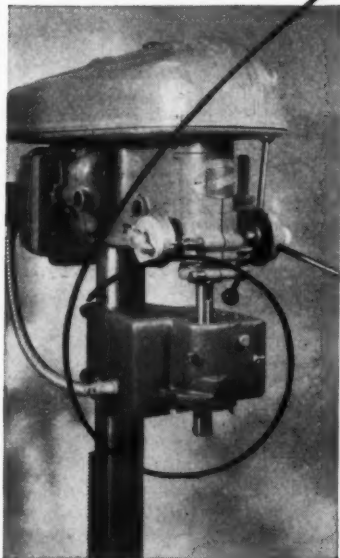
7—Wheel action depends upon the ratio of wheel speed to work speed in s. f. p. m. Increasing the ratio makes the grinding wheel act harder, and vice versa. Thus it is important in ordinary grinding to maintain wheel speed or the wheel will act too soft and so wear excessively. This is most likely to happen as the diameter of the wheel is reduced through wear. When that har-

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pens the peripheral speed should be maintained by increasing the r.p.m.

An exception to this is when an exceptionally fine surface quality is desired. This can be secured by reducing the peripheral speed of the grinding wheel to 2,000 or 3,000 s.f.p.m.

But ordinarily it is best to keep the peripheral speed of the grinding wheel at the highest safe speed for the type of bond and grade of the wheel—which for vitrified bond is 5,500 s.f.p.m. for low strength (soft) wheels; 6,000 s.f.p.m. for medium strength (medium grade) wheels; and 6,500 s.f.p.m. for high strength (hard) wheels.

Resinoid bond wheels have a top limit of speed of 6,500 s.f.p.m. for soft wheels; 8,000 s.f.p.m. for medium grades; and 9,500 s.f.p.m. for hard grades.

The correct ratio of wheel speed to work is best achieved by setting the speed of the regulating wheel which, by acting as a brake on the work, determines the rotating speed of the work. If this is too high the effect is the same as reducing the speed of the grinding wheel—the grinding wheel will act too soft, will wear too rapidly, and has to be trued excessively to maintain its shape. This not only wastes abrasive but interferes with production.

For both thrufeed and infeed grinding the starting work speed is usually somewhere between 69 and 123 s.f.p.m. depending upon the nature of the work material and the specifications of the grinding wheel.

8—Fine surface quality and a high degree of accuracy is usually secured by using hard wheels of fine grain, removing a small amount of stock at each pass and gradually building up the surface. However, on infeed work using a machine which is equipped with an automatic spindle reciprocating attachment fine finishes can be secured with comparatively coarse grained wheels, thus increasing the possible depth of cut.

In centerless grinding it is sometimes

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advisable to use a softer wheel than would be indicated by the foregoing general rules. For instance: the higher above the centerline of the wheels that the work is placed, the faster the rounding action. It is possible to have the work higher with soft wheels than with hard ones, therefore, when work is difficult to round up, use a softer wheel and raise the wheel.

In fact, it is much better on any type of work to use a wheel that is one grade too soft than one that is one grade too hard, for the softer wheel cuts faster, and is less likely to leave chatter marks or score or burn the work. While a too soft wheel will require excessive truing to restore its shape, one that is too soft will require less dressing to remove loading and glazing. On balance, a wheel only slightly too soft will often produce more parts in its lifetime than one that is too hard.

A word of warning: a not uncommon mistake, when faced with a new center-

less job, is to try grinding with a wheel of the same specifications as used for the same or a similar part when grinding between centers. In some cases it will work, but more often there is appreciable difference one way or the other in grain size, grade or structure, as shown in Table I, comparing some typical jobs which can be ground by either method.

TABLE I
Recommended Wheel Specifications

Job or Material	Centerless Grinding	Between-Centers Grinding
Alnico	NA60-L6-V1	WA46-M5-V1
Aluminum	C36-K8-V3	C36-K8-V3
Axles	A60-N6-V1	A46-N5-V1
Brass	C36-O6-V3	C36-K8-V3
Hard		
Bronze	A60-M6-V1	A46-M5-V1
Cast Iron	C36-M7-V3	C36-K8-V3
Cemented		
Carbides	GC80-K8-V3	GC60-K8-V3
Forgings	A60-P6-V1	A46-N5-V1
Steel,		
Hardened	A60-N6-V1	A46-M5-V1
Soft	A60-O6-V1	A46-N5-V1
High		
Speed	A60-M6-V1	A46-K5-V1
Stainless	C36-N7-V3	C46-M7-V3

Regardless of how accurately a wheel is selected for a job it cannot give top performance unless it is used with the proper coolant in adequate volume. To be wholly satisfactory for centerless grinding, the coolant should have the following qualities:

1—Cooling action. It is not enough to keep work temperature low. In grinding to such close tolerances as are often necessary in centerless work, it may be much more important to keep the work temperature uniform than low. Rises in temperature will cause the work to expand sufficiently to result in under size and might require rejection. The temperature should be room temperature. This requires the

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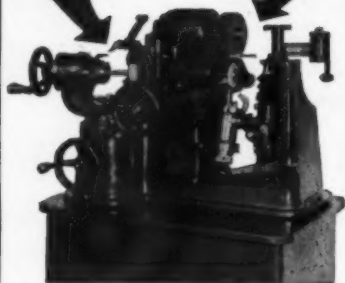
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use of large quantities of coolant—five gallons per inch of wheel face per minute is often used.

How important coolant is in holding to close tolerances is exemplified in the fuel injection plunger job described in the first article of this series, where limits of $\pm .000005$ " for size were specified, and $\pm .0000035$ " achieved, at a production rate of 600 per hour. So disastrous could minute changes in temperature be that the temperature of the coolant was regulated within very small limits by means of a thermal control device installed in the coolant reservoir.

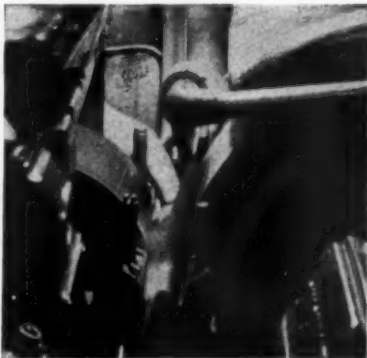
2—Low surface tension, to permit the rapid setting of dirt, abrasive particles and chips.

3—Transparency. Permitting the operator to have a clear view of the contact point between grinding wheel and work. This is of especial importance in infeed grinding or when grinding to a shoulder.

4—Harmless to bond. This is especially important in centerless grinding be-

• • •

Coolants for use with centerless grinding jobs must be chosen with care to avoid rancidity, odor or possible damage to the operators' hands.



cause all regulating wheels are of rubber bond which can be damaged by some oil coolants. There are available special coolants having only a slight effect on rubber bond wheels.

While most centerless grinding wheels are of vitrified bond, unaffected by any coolant, a few are of resinoid bond which may be affected adversely by strong alkaline coolants.

5—Viscosity. Coolants should be viscous enough to wet-out quickly, and so penetrate to the point of contact of wheel and work.

6—Rust prevention. Coolants should not cause rust on machine or work, they should prevent it by leaving an oily coating on the work.

7—Prevention of wheel loading. The majority materials, but especially the softer metals and many non-metallic ones, load the wheel unless the coolant contains enough oil to lubricate the wheel face, thus preventing the ground-off material from sticking in the pores.

8—Promoting good finish. Some coolants have a definite effect on the cutting action of a wheel and so influence the surface finish directly. An important factor is the ability of the coolant to wash away chips and dirt which, if caught between wheel and work, would mar the surface.

9—Must not separate or gum. Some coolants break down and deposit gums and sludge on the work blade or regulating wheel. That may prevent smooth and rapid movement of the work between the wheels. Such foreign material on the regulating wheel is likely to cause dimensional variations of the finished work and may even prevent the work from passing through the machine. Instability of some coolants causes this trouble.

10—Coolants should remain uniform in characteristics, so that they can be used in the same manner each time a new batch is received.

11—Coolants should not foam.

12—There should be no inflammable

fluids in coolants.

13—Soluble oils and pastes should mix easily with water.

14—Coolants should not break down, become rancid, or rot. A disagreeable odor might result also because such conditions are conducive to the breeding of bacteria resulting in possible infection of the operators. Shop-wide epidemics have been traced to that cause. All coolants should contain an antiseptic prescribed by a doctor or other health authority.

Coolants used for centerless grinding are usually an emulsion of water and soluble oil or a mixture of water and paste grinding compound. Oil is usually preferred because it mixes much easier with water.

For steel use a mixture of from 20 to 40 times as much water as soluble oil. For cast iron use the above, as for steel, with the addition of one part of 25% concentration soda solution.

For aluminum, use the coolant as for steel with addition of two parts kerosene, to keep the soft aluminum chips out of the pores of the wheel, and to help prevent wheel glazing.

For grinding fibre, use paraffin oil alone as coolant.

For grinding rubber, carbon, celluloid, casein and most other non-metallic materials, use plain water as coolant. Since there is usually high stock removal the ordinary coolant tank has insufficient capacity, so use a large external settling tank, or let the used coolant run into a sewer.

It pays to keep a record of the exact coolant mixture used for each job. Some shops insist that it is necessary, or at least desirable, to change the type of coolant whenever grinding wheel is changed. This, however, seems not to be the rule.

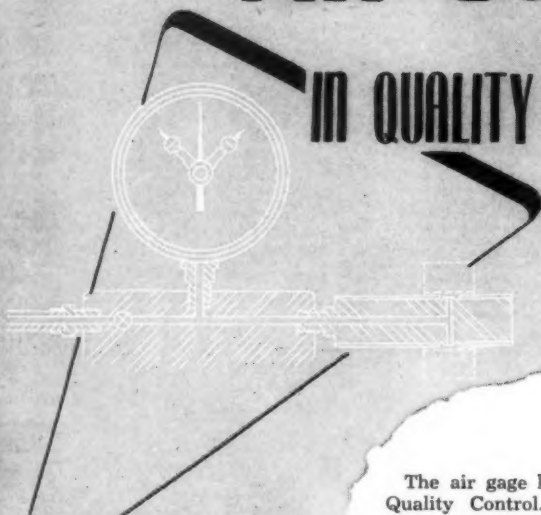
The last and concluding part of this series on centerless grinding will appear next month in MACHINE and TOOL BLUE BOOK.

TABLE OF GRINDING WHEEL RECOMMENDATIONS FOR CENTERLESS GRINDING

JOB	MATERIAL	SPECIFICATION
ARMATURE ARMATURE SHAFTS AXLES—AUTOMOBILE	Silicon Steel See "Shafts" S.A.E. axle steel (hard) (Wheels 4" thick & thinner). (Wheels generally used in pairs. Narrow wheel P grade). S.A.E. axle Steel (Wheels 4" to 6" thick) Hard Carbon Steel	A46-P5-VI A60-06-VI A60-P6-VI A60-05-VI A150-N7-B2
BALL OR BALL STUD FINISHING BALANCE STAFFS BALL BEARING RACES BARS OR RODS	Hardened Steel See "Bearings" Brass & soft bronze Bronze—hard Carbon Chromium plated (finishing) Cold rolled and cold drawn steel. Drill rod—high speed steel and carbon steel Drill rods—stainless steel High speed steel up to 3/4" diameter. High speed steel 3/4" diameter and larger Miscellaneous steel Nitricity (before nitriding) Non-metallic—Fibre, Celluloid, Rubber, Pyrolin Silichrome steel Silicon manganese steel Stainless steel Tungsten and Tantalum carbide alloys Babbitted bearings Treated Bronze	A100-07-B2 C36-N7-V3 C60-L7-V3 C36-N7-V3 WA120-N6-VI A60-P5-VI A60-N5-VI C36-N7-V3 A60-N6-VI A60-N5-VI A60-N6-VI A60-M5-VI C60-L7-V3 A60-N6-VI C36-06-V3 C36-N7-V3 GC00-J7-V3 C60-K8-V3 A60-M6-VI
BEARINGS	High Carbon, High Chrome steel wheels 20x6x12 and smaller. Outer rings up to 4" in diameter High carbon chrome steel wheels 24x6x12 and larger. Outer rings up to 4" in diameter. High carbon, high chrome steel, outer rings up to 12" in diameter. Hardened steel rings with very thin walls (1/8" thick) Tapered inner race cone nickel steel	A80-N6-VI A80-M6-VI A70-J5-VI A70-I5-VI A100-M6-VI A60-M6-VI
BEARINGS—CUPS RACES, RINGS, CONES	Steel tubing—case hardened High carbon steel and special alloy steel roller wheel 20x2x12 and smaller, for small rollers Wheels 20x6x12 for larger rollers Special alloy steel (Finishing). Case hardened—shoulder grinding.	A100-P5-VI A60-05-VI A150-P5-B1 Composite wheel Body—A60-05-VI Edge—A60-05-VI A60-N6-VI A80-05-VI A80-05-VI Composite: Body—A60-05-VI Edge—A60-05-VI A150-P7-B2
BEARING HOUSINGS ROLLER BEARINGS	Case hardened—no shoulder grinding. Hard and soft steel Hard and soft steel	
BEARING SLEEVES BOLTS	Case hardened—finishing See "Bars" See "Bars" Steel forging Brass Bronze—soft Bronze—hard Cast iron Steel—case hardened Hardened steel See "Bars" Cast iron Hardened Steel See "Bars" Hardened Steel Steel Forging See "Bars" Stampings—thin walls See "Bars" Hardened high speed steel 3/64" to 1" in diameter For carbon steel go one grade harder. Hardened high speed steel 1" diameter and larger. For carbon steel go one grade harder. Cast iron Brass	A100-P5-VI A60-05-VI A150-P5-B1 A60-P5-VI A60-P5-VI C36-K8-V3 A60-06-VI C36-L7-V3 A60-N6-VI A60-N6-VI C36-L7-V3 A60-N6-VI A100-07-B2 A60-P5-VI A60-K6-VI A80-M6-VI A80-N5-VI A70-N6-VI C36-L7-V3 C36-L7-V3
BOLTS—FLY WHEEL BOLTS—SPINDLE	Case hardened—finishing See "Bars" See "Bars" Steel forging Brass Bronze—soft Bronze—hard Cast iron Steel—case hardened Hardened steel See "Bars" Cast iron Hardened Steel See "Bars" Hardened Steel Steel Forging See "Bars" Stampings—thin walls See "Bars" Hardened high speed steel 3/64" to 1" in diameter For carbon steel go one grade harder. Hardened high speed steel 1" diameter and larger. For carbon steel go one grade harder. Cast iron Brass	A60-P5-VI A60-P5-VI C36-K8-V3 A60-06-VI C36-L7-V3 A60-N6-VI A60-N6-VI C36-L7-V3 A60-N6-VI A100-07-B2 A60-P5-VI A60-K6-VI A80-M6-VI A80-N5-VI A70-N6-VI C36-L7-V3 C36-L7-V3
BRASS BRONZE BRACKETS BUSHINGS	Chrome Vanadium Steel Steel Soft Steel Soft Steel Glass Stainless steel Carbon Steel	A60-P6-VI A60-P5-VI A60-Q5-VI A36-P5-VI C220-M7-V3 C36-N7-V3 A70-R5-VI
CAM ROLLERS CARBON CAST IRON CHAIN ROLLERS CHROMIUM PLATED STEEL CLOCK ARBORS CLUTCH RELEASES (AUTO) COLD ROLLED STEEL CUPS DRILL ROD DRILLS		
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HIGH SPEED STEEL	See "Bars"	
KING PINS	Hardened steel	A60-L6-V1
KNUCKLE BALLS	Case hardened steel	A100-07-B2
KNUCKLE—STEERING	Steel forging	A60-P5-V1
LATHE CENTERS	High carbon, high chrome steel	A60-L6-V1
MISCELLANEOUS OR JOB	Steel—hard and soft Screw stock, forgings, bar stock etc.	A60-M6-V1
LOT GRINDING		
MISCELLANEOUS OR JOB		
LOT GRINDING (FINISHING)	Steel	A150-N5-B2
NITRILOY	See "Bars"	
(BEFORE NITRIDING)		
NON-METALLIC FIBRE,	See "Bars"	
CELLULOID, RUBBER,		
PYROLIN		
PENS—BARRELS AND CAPS	Pyrolin	C60-L7-V3
PINS—HINGE PINS, ETC.	Cast iron	C36-M7-V3
	Steel	A60-N6-V1
	Stainless-Steel	Rough—C36-N7-V3
		Finish—C70-06-V3
PIPE BALLS	Manganese steel	A30-T6-V1
PIPE BALLS—Regrinding	Manganese steel	A36-T6-V1
PISTONS	Cast iron or aluminum	C60-J7-V3
PISTON PINS	Hardened steel—Rough	A60-N6-V1
	—Semi-Finish	A100-N5-B2
	—Finish	C220-M7-B2
PISTON RODS	Soft steel	A60-N6-V1
(Shock Absorber)		
PORCELAIN	Porcelain	C36-K8-V3
PUMP ROTOR AND ROTOR	Cast iron	C36-J7-V3
STEMS		
PUMP RODS	Hard Chrome steel	NA120-M6-V1
SHAFTING	Cold drawn and cold rolled steel	A60-P5-V1
	Stainless steel	C36-M7-V3
	Hardened steel	A60-M5-V1
	Soft steel up to 3/4" dia. Rough and finish	A60-05-V1
	Hardened steel up to 3/4" dia. Rough & Finish	A60-05-V1
	Soft steel 3/4" dia. and larger. Rough & Finish	A60-N6-V1
	Hardened steel up to 3/4" dia. Rough & Finish	A60-N5-V1
	Hardened steel, high finish	A150-N7-B2
	Nitroloy steel before nitriding	A60-N6-V1
	Allegheny Metal stainless steel	C36-L7-V3
	Chrome stainless steel	C60-M7-V3
	Steel forgings	A60-N6-V1
SHAFTS—DRIVE	Hardened steel	A60-L6-V1
SHAFTS—PISTON AND	Hardened Steel	Composite
SECTOR		(A80-N6-V1)
SHAFTS—SPLINE		(A80-P6-V1)
SHAFTS—WRINGER ROLL		A60-N6-V1
SHOCK ABSORBER ARMS	Steel forgings	
SILCHROME STEEL	See "Bars"	
SILICON MANGANESE	See "Bars"	
STEEL		
SLEEVES—CYLINDER	Chrome nickel cast iron alloy	C60-K7-V3
INSERT SLEEVES	Hardened steel	A100-07-B2
SOUND BOX PIVOTS	Soft Steel	A150-L6-V1
SPARK CONTROL PLUNGERS	High carbon steel	A60-N6-V1
SPINDLES	See "Bars"	
STAINLESS STEEL	Hard and soft steel	A60-P5-V1
STEERING SECTIONS	Soft steel (small)	A60-P5-V1
STUDS	Hardened steel (small)	A60-N6-V1
TAPPETS	Cast iron	C36-N7-V3
	Steel Hardened	A60-M5-V1
TIE-ROD BALLS	Soft steel	A60-R5-V1
TUBING	Butt Welded Black Pipe Tubing	A60-P5-V1
	Case Hardened Steel Tubing	A60-L6-V1
	Chrome Nickel Tubing	A60-L6-V1
	Low carbon steel	A60-N6-V1
	Shelby Stainless steel tubing	C60-L7-V3
	See "Bars"	
TUNGSTEN—TANTALUM		
CARBIDE ALLOYS	Steel	A100-06-V1
UNIVERSAL JOINTS	Cast iron	C36-05-V3
VALVE GUIDE BUSHINGS	31-40- & 21-12 Steel (roughing)	A60-N6-V1
VALVE STEMS	Silichrome Steel & 120 Steel	Composite:
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		(A60-05-V1)
		Regular Wheels:
		(A60-06-V1)
		C341-05-V3
		A60-06-V1
		C341-05-V3
		A60-T3-V1
		A60-06-V1
		C24-K9-V3
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WIRE—SPOKE WIRE	Heat treated steel	
WIRE—SPRING WIRE	Stainless steel	
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THE USE OF **Air Gages** IN QUALITY CONTROL



**BY FRANK W. BLANCHETTE
THE MOORE PRODUCTS CO.**

By assuring fit and clearance of precision components, the pneumatic comparator has become an important part of quality control systems.

The air gage has a definite place in Quality Control. This statement may seem strange to those who still talk about this equipment as "a new development." Perhaps too much emphasis has been placed on its unusual and special war-time applications when the pneumatic comparator was generally applied to difficult jobs, such as inspection of gun bores, bomb-sight components, and lead-indium aircraft engine bearings. The air gage with its simplicity of use, its freedom from error due to the human element, and the high amplification it made available provided

a logical solution to these complex inspection problems.

This war-time experience led to a recognition of certain advantages in the air gage when applied to standard gaging operations. These advantages are due mainly to the simplicity of pneumatic gage design and operation. (See Fig. 1). The pneumatic plug used with the comparator, for instance, has a permissible wear of approximately .002" even on units for measuring tolerances as close as .0002". This is because the plug itself has no function except to position the work over two air jets which do the measuring. Another advantage lies in the clearance of approximately .001" which is provided between the plug and the minimum dimension of the work to be gaged, so that parts are easily placed over the plug. Furthermore, since air pressure is the medium of gaging, accuracy, is unaffected by dirt, oil, or grinding compound on the parts. This is particularly true of

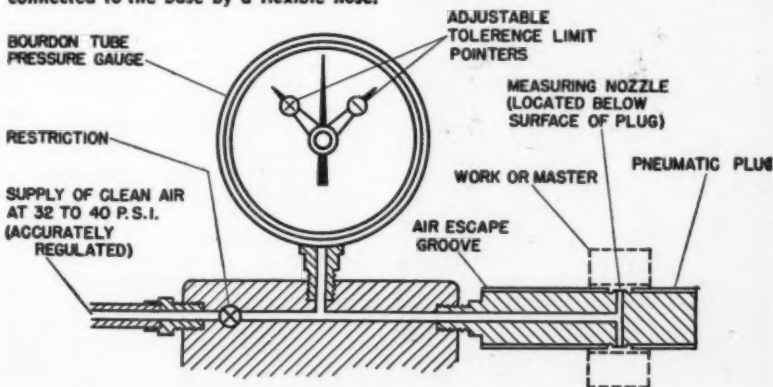
air gages which employ the "high-pressure" system of approximately 32 to 40 p.s.i. supply. Fundamentally, the comparator is calibrated by the use of setting masters and the work is compared to these standards. In plants which use a number of pneumatic comparators on identical parts, all of the gages can be calibrated with one set of masters, thus insuring uniformity in the quality of production.

AIR GAGE MEASUREMENT AT THE MACHINE

The use of the pneumatic comparator in inspection departments naturally led to its introduction at the machine, where its advantages became even more apparent. Fig. 2. With the amplification provided by the pneumatic comparator, tolerances could be maintained readily and equipment operated at maximum efficiency. Therefore, the air gage, which originally was an inspection tool, became a part of production tooling.

• • •

Fig. 1. Schematic diagram of a typical pneumatic comparator gage. Note that the plug has no function except to position the work over two air jets which do the measuring. The pneumatic plug may be mounted on the instrument base, as shown, or connected to the base by a flexible hose.



Automatic grinding and boring equipment was kept in control by the operator. Taper, bell-mouth, barrel shape, out-of-round, and other variables which were beyond the capacity of the automatic size-controls of the machine could be determined immediately by the pneumatic comparator.

INTRODUCTION OF AIR GAGES INTO QUALITY CONTROL SYSTEMS

Parallel with the introduction of the air gage into manufacturing plants, statistical control methods were being introduced. Critical bore measurements, which had been unobtainable until this time, and, therefore, limited the development of statistical control, were made available thru the use of the air

Fig. 2. Using an air gage for process inspection of ball bearing bores. The adjustable pointers are set to the control limits rather than to the full blueprint tolerance, as shown in Figure 3. The operator aims for the mean dimension.

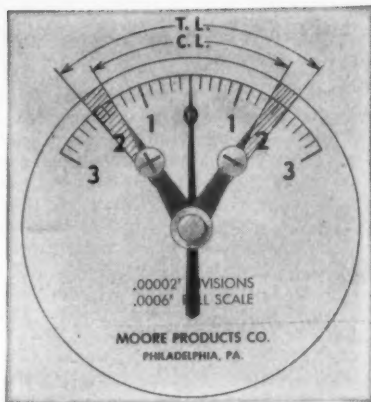


Fig. 3. The readability of a typical air gage is illustrated above. On this scale, 0.0001" is shown by approximately $\frac{5}{16}$ " pointer travel. Actual diameter of the dial is $3\frac{1}{2}$ ".

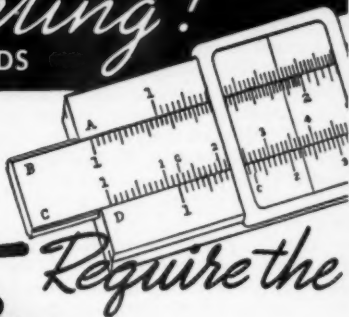
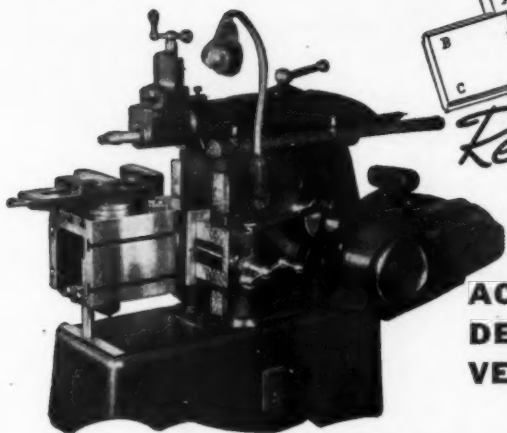
gage. With the amplification this instrument provided, tolerances could be magnified to readable values and control limits be set without difficulty. In some cases, amplification of .0001" to one inch of pointer motion was supplied. Fig. 3. In this system, in which machine operators were responsible for their own quality, sampling methods in the inspection department provided sufficient data, thus eliminating costly 100% parts inspection. Frequency distribution surveys kept machine tool equipment at maximum efficiency.

The above procedure has produced startling results and has permitted the manufacturer to study, with sufficient technical information, the assembly of mating parts. In almost all cases, now that parts had been accurately measured, the remaining problems of assembly were found to be the result of a lack of understanding of fit and clearance values.

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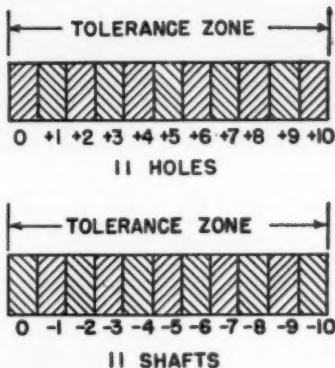
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BASIC PRINCIPLES OF FIT AND CLEARANCE VALUES

As a first step in understanding how fits are obtained in actual cases, it is important to observe the probability of securing a fit which is close to the theoretical average value, and to observe the probability of obtaining the theoretical maximum and minimum clearance for interference. Without a correct understanding of this problem, the result may be that an unnecessarily close tolerance zone will be specified. The reason for this is: when selecting fits, the designer has a tendency to consider only the theoretical possible extremes—the maximum and minimum clearances—and these values frequently may appear to be unsatisfactory. From the following points, it will be seen that these theoretical extremes actually are seldom obtained when the tolerances are measured in a correct manner and are held accurately. Let us assume, for



DEVIATION IN TEN-THOUSANDTHS

Fig. 4. Size distribution of first example.

example, that we have eleven work pieces, each containing a bore, and



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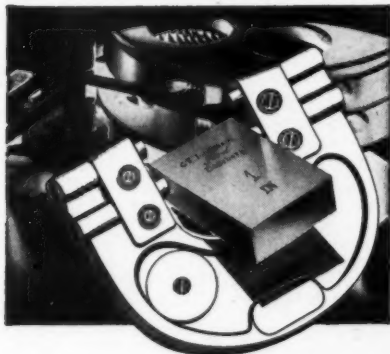


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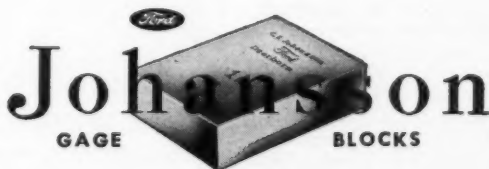


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eleven shaft pieces, all having diameters within the tolerance zone shown in Fig. 4. Although the example would hardly exist in practice, let us also assume, for the purpose of simplicity, that the distribution of the diameters is on the basis of one piece for each .0001". Zero hole is the smallest diameter hole and zero shaft is the largest diameter shaft. In this example, it is apparent that there are 121 possibilities of combining shafts and bores, and yet there is only one combination which will give the theoretical minimum clearance. (Zero hole and zero shaft). The probability that either the minimum clearance or the maximum clearance would occur is, therefore, 1 in 121. Two possibilities exist for obtaining a play of .0001"—this play is obtainable by matching the zero hole with the minus one shaft, or the plus one hole with the zero shaft. At the other extreme, there are eleven possibilities for obtaining a clearance of .0010" (the zero hole with the minus ten shaft, the plus one hole with the minus nine shaft, etc.). Note that a clearance of .0010" is the theoretical average. The frequency curve for our first example is shown in Fig. 5. In practice, however, the conditions are much more favorable, in that we will get a better distribution of diameters within the specified tolerance zone.

The next graph, Fig. 6, shows a lot of thirty-six shafts and thirty-six holes. Arbitrarily, this example has been made in agreement with actual practice. Here, the different parts are so assigned that we have a normal distribution, with the maximum number of shafts and holes exactly at the center of the tolerance zone. From the conditions shown in Fig. 6, we would obtain a fit-distribution curve similar to Fig. 7. In this example, the probability of obtaining either the maximum clearance or the minimum clearance is only 1 in 1296. The probability of obtaining the average fit (.0010") is 146 times as great as the

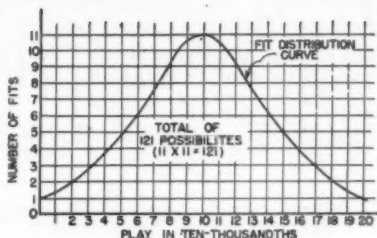


Fig. 5. Fit distribution of first example.

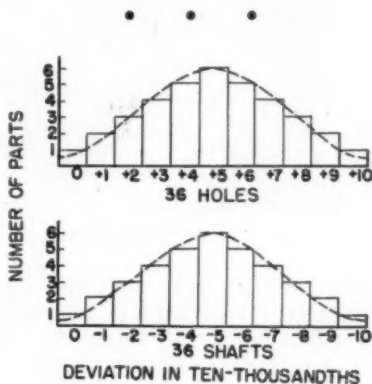


Fig. 6. Size distribution of second example.

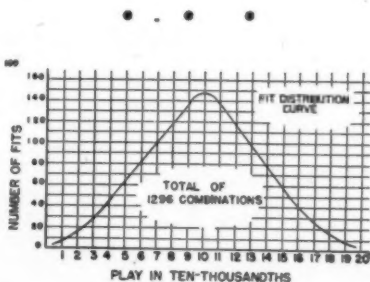


Fig. 7. Fit distribution of second example.

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probability of obtaining the minimum or maximum fit.

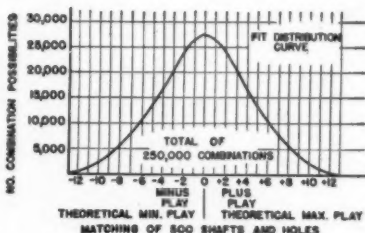
This topic of fit and clearance has been of particular importance in the ball and roller bearing industry. Significantly, this field has been a leader in using air gages to establish quality. Fig. 8 shows the actual result of the use of air gages in the establishment of proper fit. In this actual case, 500 holes and 500 shafts were checked at random from production runs over a period of several days. The machine tool equipment was held in control on both O.D. and bores by permitting the operators to use pneumatic comparators for measurement. The operators were instructed to aim for the mean dimension rather than to be satisfied simply to make the parts within tolerance. This sizing method was a far cry from the usual procedure. In the case of bore

grinding, standard "go" and "no go" plug gages had been used, while in the O.D. grinding, standard types of "go" and "no go" snap gages had been employed previously.

It has been generally concluded by

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Fig. 9. Fit distribution of mating parts (actual case).



• • •

Fig. 8. Size distribution of mating parts (actual case).

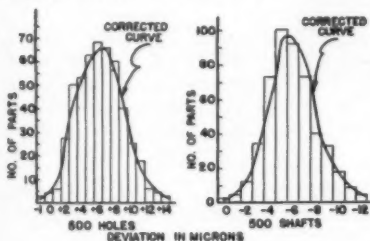
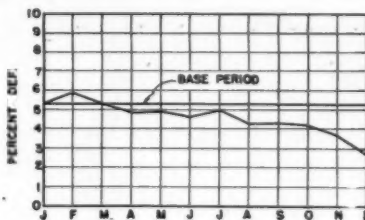


Fig. 10. Total rejections (by months), first year.



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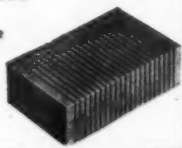
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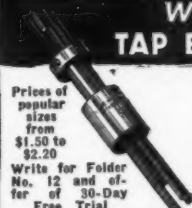


Quality Control groups that when the "blind" or "feel type" system of gaging is used, the frequency distribution curve is always on the small side in boring operations and on the large side in O.D. grinding. This is probably the case because the operator feels safer, when grinding bores, for example, in keeping his work on the "tight" or safe side, rather than running the risk of producing oversize scrap parts. Since the O.D. of the shaft is also being ground on the "safe" side, our clearance values are reduced by the sum of these deviations. It becomes obvious, after reviewing this condition, that if we work to the mean dimension on both bores and O.D.'s and control our frequency distribution, our clearance values can be maintained and actually controlled to a much closer degree than has been realized previously.

When the 500 holes and 500 shafts were assembled, the fits were in accordance with the frequency curve

shown in Fig. 9. In this actual case, the probability of obtaining the average fit was approximately 730 times as great as the probability of obtaining one of the theoretical extremes. Then, as many as 235,700 out of a total 250,000 possible assemblies—or about 94% of the total lot—gave a fit within the range plus or minus 6 microns (which was one-half of the theoretical variation of the fit).

One of the country's leading bearing manufacturers recently analyzed customer complaints. The result of this analysis showed that **not one** complaint concerning the fit of their bearing bores on customers' parts in six months of operation had been received. This plant had been machining bearing bores in the manner described above. The mean dimension was the goal of each machine operator. Control limits were established by the Quality Control group, and frequency distribution of the bearing bores had been controlled.



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Fig. 10 shows an actual report from a large bore-grinding department for




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the first year of its operation with pneumatic comparator gages. The base-period rejection line was determined from the average of rejections for the previous year, when such equipment was not available on the machines. This base-period rejection line was approximately 5.3% and was considered typical of the industry. This figure includes scrap and rework material. During the period between March and July, a complete Quality Control System was established, and the pneumatic comparator gages were placed in operation. By July, all operators were provided with this means of indicating and exploring bores for various hole conditions and of watching the trend of their operations.

Fig. 11 shows the continuation of this record into the second year. The base period line—established from the experience of the previous year (Fig. 10)—was an average of 4.5%.

Fig. 12 shows the rejection rate for the first four months of the third year. The base period line of 2% was established upon the average rejection for the previous year, shown in Fig. 11. Note that the rejection rate continued to be reduced. It may be safe to assume from this general trend that the rejection percentage of this department will average about one-half of 1% in the future—a tremendous reduction from the original 5.3% which was the industry's approximate average percentage of rejection for this type of work.

MULTIPLE-DIMENSION AIR GAGES

Originally, multiple - dimension air gages were used on inspection operations. This was particularly true in the bearing industry, where the I.D. and O.D. of assembled bearings was measured on a duplex pneumatic comparator gage. It developed quite naturally, however, that the application of the single-dimension air gage on machine operations brought a demand for multiple-dimension gages in Production

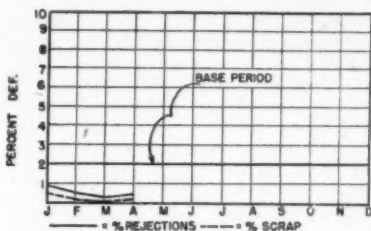


Fig. 11. Total rejections (by months), second year.

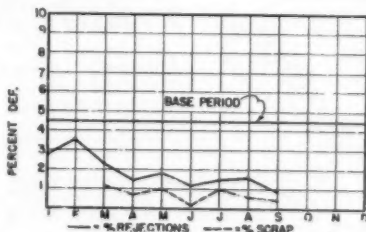
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Quality Control. The finished machining of two or more dimensions in one operation has resulted in the application of duplex, triplex, or quadruplex pneumatic comparator gages.

Final inspection of finished parts, or assemblies, may require 100% inspection. In these cases, it has been found that the use of multiple simultaneous gaging has permitted 100% inspection at a cost which compares with a sampling system using individual conventional-type gages. Where length, depth, or concentricity tolerances permit, the use of mechanical dial indicators can be incorporated with the air gage, to provide more economical multiple gaging. The air gage itself can be used for any com-

• • •

Fig. 12. Total rejections (by months), third year.



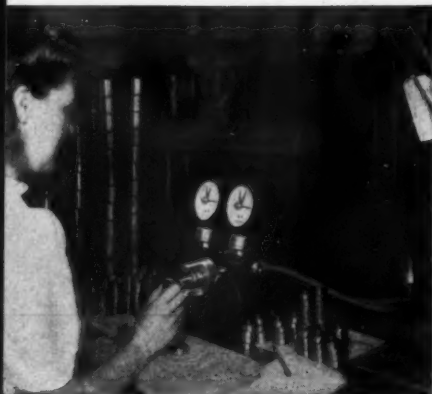


Fig. 13. Final inspection of ball bearings, using a duplex air gage. The operator is measuring both I.D. and O.D. for size, taper, and out-of-round.

• • •

bination of dimensions in O.D., I.D., concentricity, length, depth, or other dimension.

SUMMARY

In reviewing the various points considered in the foregoing paragraphs, we may draw the following conclusions:

(1) If any Quality Control program is to be effective, it must be based upon proper measuring instruments in the hands of the machine operators.

(2) In order to make full use of the economical advantages of a Quality Control System, parts should subsequently be subjected to a sampling method of inspection, rather than to a costly 100% parts inspection.

(3) Frequency distribution analysis should be made on production operations, in order to:

a—hold production as near to mean dimensions as possible.

b—keep equipment operating consistently.

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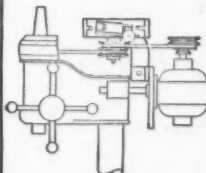
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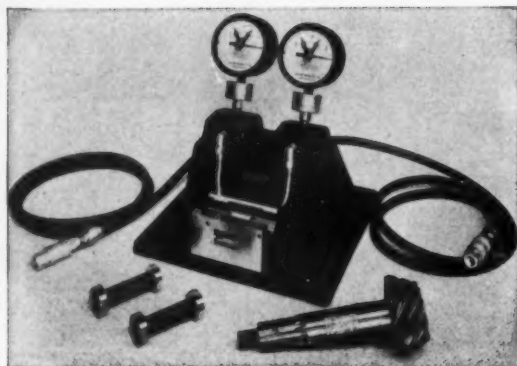


Fig. 14. An air gage which measures, simultaneously, two diameters on the pinion shaft. This equipment is used by the machine operator.

c—provide performance data on cutting tools, grinding wheels, or machine tools.

d—check the efficiency of the operators.

(4) Where the type of finished product requires 100% inspection, multiple-dimension gages for simultaneous inspection of critical dimensions should be employed to reduce inspection costs.

Through the application of air gages to the above system, it becomes possible to work to the mean dimension on mating parts and to hold production within control limits, rather than within the blueprint tolerance limits. Where full tolerance limits are required, the air gage permits more accurate control,

reducing the possibility of interference or excessive clearance in assembly.

In addition to the economic advantages in controlling the quality of production, our foregoing procedures also provide an accurate picture of the quality of the products which are shipped. These methods also provide a better understanding of the influence of manufacturing variables on this quality and furnish ample data which can be used for establishing inspection specifications.

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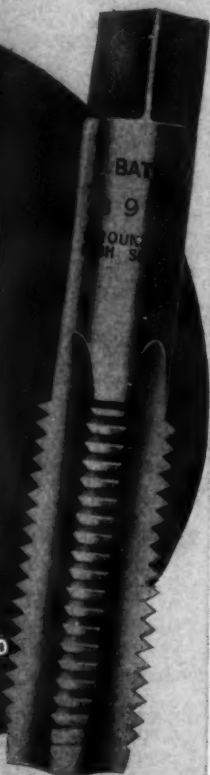
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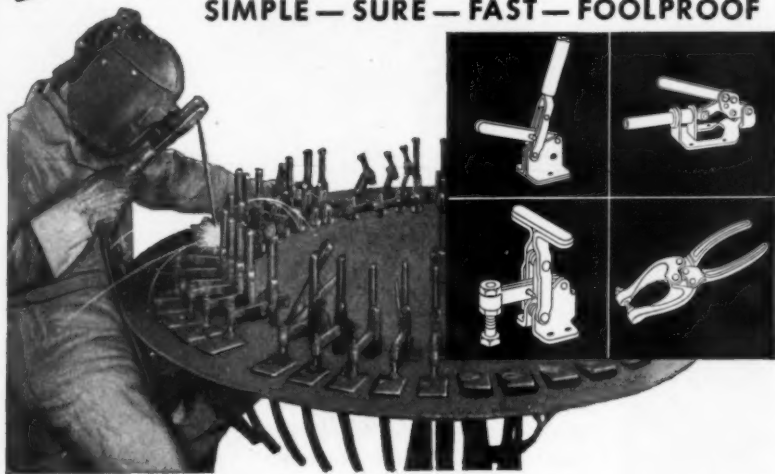
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BAKER**

Section II — Instrument Inspection, Cont'd. Part 10 — The Sine Bar and Its Use in Inspection

Angles, bevels and tapers can be measured accurately to 30 minutes, or half a degree, with the protractor or bevel protractor. Angles to 5 minutes, or 1/12 of a degree can be measured with the vernier bevel protractor. But measurements of angles to less than 5 minutes require the use of the sine bar, whether in production work or inspection.

The sine bar is one of the most useful and versatile of all inspection instruments. Its only purpose is to reduce the measurement of angles to the terms and functions of the right triangle, and thus bring to a minimum the amount of trigonometric calculation that otherwise would be required.

Before discussing the use of the sine bar in inspection practice let's review a little high school mathematics. The square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides. The sum of the angles in a triangle is always 180°; also, the complement of an angle is the difference between the angle and 90°, while the supplement is the difference between the angle and 180°.

In geometry, it was evident that, as the altitude of a right triangle increased, the angle between base and hypotenuse increased. This fact, in con-

junction with the one mentioned earlier concerning the sum of the squares, makes it evident that there must exist some easily expressed ratio between the increasing altitude and the expanding angle of a right triangle.

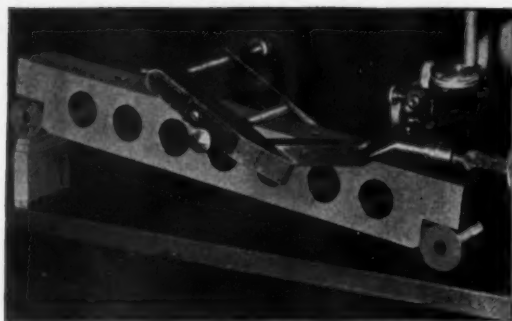
In trigonometry, this ratio is expressed by the simple formula $\sin \theta = \frac{a}{c}$, where a is the altitude, c the hypotenuse and θ the angle opposite the altitude. The sine of an angle then, is the ratio between the lengths of its opposite and adjacent sides.

From the formula just given, $\sin \theta = \frac{a}{c}$, by algebra we get $a = c \sin \theta$. (From geometry, we know it also equals $\sqrt{c^2 - b^2}$ where b is the length of the base).

With the sine bar, that is all the mathematics you need to know, provided you can use a simple set of sine tables or, if you insist on doing it the hard way, a set of tables of square roots.

Bar Is Hypotenuse

The reason is this: the sine bar is always the hypotenuse of your triangle. With the 5 inch sine bar, that means the hypotenuse is always 5 inches. With the 10 inch sine bar, it is 10



Photographic view of a typical setup for measuring taper of a taper plug gage. Note that the sine bar is a 10" one. The setup is made so the whole side of the gage, from end to end, is parallel to the surface plate. (Courtesy Ford Motor Co.)

inches. Using the 5 inch bar as an example, then, we can substitute in the formulas given earlier and make them apply directly to the 5 inch bar, thus:

$$\sin \theta = \frac{a}{5}, \text{ and } a = 5 \sin \theta. \text{ The length}$$

of the base of the triangle you form with the sine bar is seldom of importance in instrument inspection. The important factors are the angle opposite the altitude and the altitude itself.

In other words, if we know the altitude, the problem is always to find the angle, and given the angle, the problem is to find the altitude. Manufacturers have spent many weary hours working out, compiling, and publishing special "sine" tables for the 5 inch sine bar, most of them worked to seven places and corrected back to six. (These actually are tables of altitudes, not sines). With such tables, which unfortunately are too lengthy to be reproduced here, if the angle is known, the correct altitude can be read directly to the millionth place. If the altitude is known, the angle can be read to the seconds. Interpolation aids usually are given to make the reading in seconds a simple thing.

If much work is to be done with the sine bar, such a table should be procured and placed in a handy location.

The 5 inch table can be made to serve with the 10 inch sine bar by multiplying the altitude by 2 or dividing the angle by 2.

So much for the math. Let us now look at the instrument. The 5" sine bar is usually a bar of stabilized, highly finished chrome steel about 5 $\frac{3}{4}$ " long, the ends of which rest on two cylindrical rolls, mortised into the lower edge of the bar, and the centers of which are 5" apart, within at least 0.000050", or 0.000010" per inch of length. Such a bar is shown in Fig. 1. Some, for especially high precision work, are made to even greater accuracy.

The surface, or face, of the bar should be parallel to a tangent at the bottom of the rolls within 25 millionths of an inch, and the face should be flat within 50 millionths between the centers.

How to Use Instrument

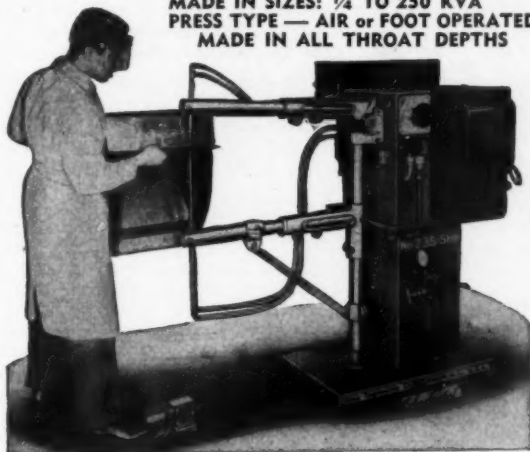
Now, as to application: In any problem involving angular measurement, the sine bar is set up so that the length of the bar, 5 inches, becomes the hypotenuse of the triangle. The altitude then can be set up by placing gage blocks under the roll at one end, while the other rests on some accurate surface, preferably an accurate surface plate or toolmaker's flat.

If we set up the bar to parallel or equal a given angular surface and wish

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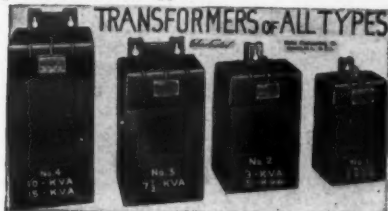
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to know the angle being measured, we read from the gage blocks the measurement of the altitude and refer that measurement to the table, from which we can read the angle. If we know the angle and want to know what height is required so the face of the sine bar will be presenting that angle with the base on which it rests, we look up the angle in the table and find out what altitude is required, then build up gage blocks to equal that altitude.

Let us suppose, for instance, that we have an altitude of 2.429135" and want to know what angle is being measured. In the table we find the angle is 29° 4'. If we had an angle of 41° 9', for instance, we find in the table that the altitude should be 3.290163".

Let us suppose further that we have an altitude, or perpendicular, of 3.6849" and need to know the angle. From the table we find that it lies somewhere between 47° 28' and 47° 29'. The altitude for the first is 3.684421" and the second, 3.685404". Subtracting the altitude for the lesser from the greater, we get

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Fig. 1—The simple sine bar, set up with gage blocks as the altitude of the triangle it forms.



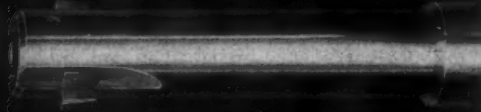
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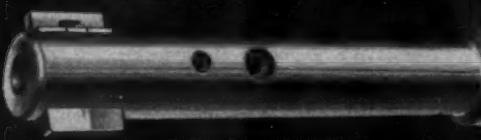
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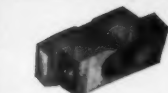
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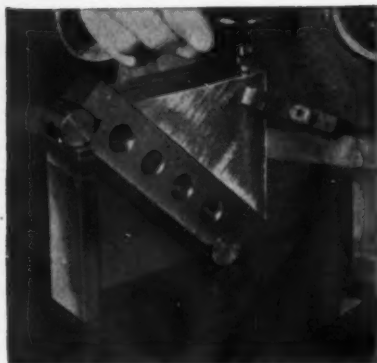


Fig. 2A—Setup for measuring angle plate with the sine bar and comparator.

0.000983". Subtracting the lesser altitude from the given perpendicular, we

0.000549

get 0.000549". Then $\frac{\quad}{0.000983} \times 60$ is the

0.000983

number of seconds to be added. We find that 549 divided by 983 is .56. This, times 60, is slightly more than 33 seconds. The same result can be had by making use of the table of second constants usually given with such tables of sine bar altitudes. It speeds up the arithmetic.

Now, let us suppose you have an angle of $35^{\circ}41'9''$ in your specifications and you wish to stack up gage blocks to an altitude that will cause the sine bar to measure this angle. The process just given is reversed, thus:

From the table, $35^{\circ}41'$ has an altitude 2.916525"

From the table of second constants, the constant for 35 to 40° is 0.0000192.

For $9''$ this is 9 times the constant or

0.0001728"

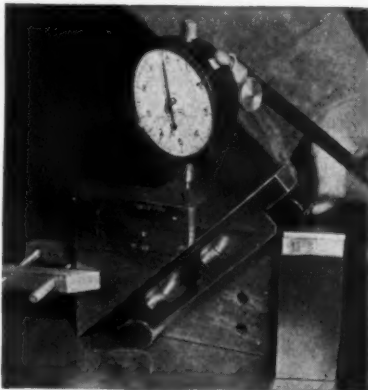
Adding, we get 2.9166978" and that is the height of the altitude,

or side a, that you will have to build up with gage blocks to make the sine bar measure an angle of $35^{\circ}41'9''$.

If you followed closely the recommendations given in earlier parts of this series on the building up of complex combinations with gage blocks, you will have no difficulty. The vernier block will quickly eliminate the 78 at the end. Three quarters of a gradation to the right will give you 0.700075" or one quarter to the left will give you 0.699975", and that's as close as you can come with gage blocks, or anything else.

Now, let us suppose that you do not have any special tables for use with the sine bar. In that case, you will have to use the tables of natural sines given in any good machinists's handbook. To use these tables, you will have to use the formulas given a little earlier, i.e. the sine of the angle equals the altitude divided by 5, while the altitude equals 5 times the sine of the angle. All you have to do, then, is multiply the natural sine given in the tables by 5 to get the

Fig. 2B—Setup for measuring angle plate with sine bar and a dial gage in tenths of thousandths of an inch.



altitude, or divide the sines given in the natural tables by 5, then read the angle.

If no tables are available it would be best to use a bevel protractor. It can be done, but not to any great accuracy because the length of the side b , or base of the triangle, must be known or measured; this is difficult to measure accurately.

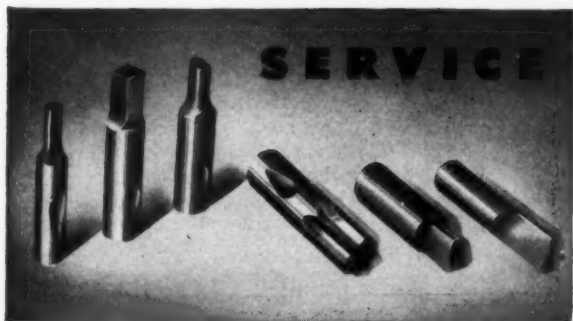
The base may be marked off by setting up a solid square to project the center of each roll to a paper placed on the surface plate and the distance between marks measured with calipers and transferred to some accurate medium of measurement, but the chance for error in estimating the exact centers of the rolls is high and the further chance for error in transferring the measurement makes the method too unsure for any sort of inspection work. The simple geometric formula given earlier, however, is the basis for the

calculation if there is no other way to make such measurement, or if accuracy to about half a degree is sufficient.

It should be pointed out here that the sine bar is seldom used to measure angles greater than 60° directly. From 60 to 90° the angle is so steep and the baseline so short that it usually is better to measure with complementary angles. Cosines, rather than sines, will then be used by the more accomplished mathematician in his calculations.

Sine Bar in Inspection

The sine bar has so many uses in measurement problems that it is obviously impossible to detail all of them here, even if any one writer could possibly know of all the applications, which he could not. Nevertheless, a few of the typical uses will be explained in the text. Once the method is understood, the application of the instrument to a particular problem is a simple matter.



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One of the commonest uses is the measuring or inspection of angle plates, by the method shown in Fig. 2A. The sine bar is set up to the angle required to measure the plate, the plate is then clamped to the proper position and the top edge moved under a comparator spindle (or a dial gage as in Fig. 2B) to make sure that the angle is correct over the entire length of the plate's face. Any drop or gain in the comparator reading shows either that the base or the angle is out. In a setup such as that shown, if the angle sets solidly against the sine bar along its entire length, any error found necessarily will be in the base.

Other common uses for the sine bar and sine fixtures are in the inspection of tapers of such devices as bevel gears, plug gages, keys and gibs.

In Fig. 3A is shown a typical conical taper, such as would be used for a taper gage. The taper in inches per foot is found by this formula:

$$\frac{D - d}{L} \quad \text{(inches)}$$

$$L \quad \text{(in feet)}$$

The second drawing, Fig. 3B, shows how to set up the gage on the sine bar to check the taper. Such a setup is shown also in the photo. Table I gives the heights called for by the 5 inch sine bar in checking specific tapers from $\frac{1}{4}$ " to 6 inches.

Fig. 4A shows a typical taper key or gib. The formula for finding the taper in inches per foot is much the same, $H - h$ (inches).

The setup is shown in

$$L \quad \text{(feet)}$$

Fig. 4B and table II gives the heights required for the 5 inch sine bar for the tapers from $\frac{1}{16}$ " to 3 inches.

A setup for checking the accuracy of a bevel gear is shown in Fig. 5. In a job such as this, the angles are about as complex as they ever get, so the geometry must be watched closely in making the setup. A dial gage is shown

making the check. If particular accuracy is required, a comparator can be substituted.

Setup of Angle Comparator

If there is much angle plate inspection work in the tool room, an angle comparator setup such as that shown in Fig. 6 had better be used. Once the setup is made, much time will be saved

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Fig. 3A—Explanation of terms in formula in text for measuring conical taper.

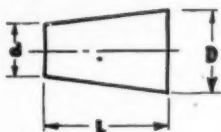


Fig. 3B—Use of sine bar in checking proper taper of a taper plug gage.

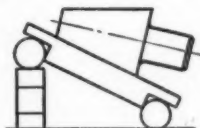
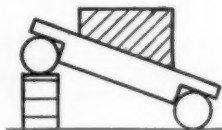


Fig. 4A—Explanation of terms in formula in text for checking taper.



Fig. 4B—Use of sine bar in checking taper of a taper key.



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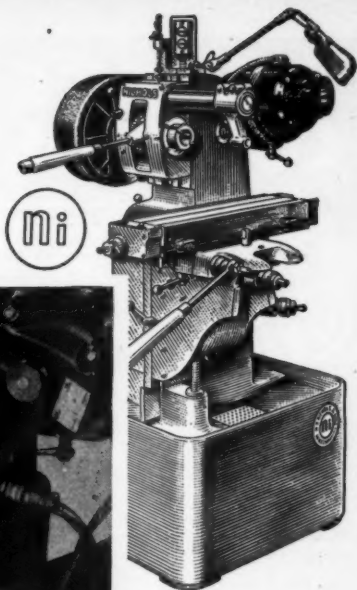
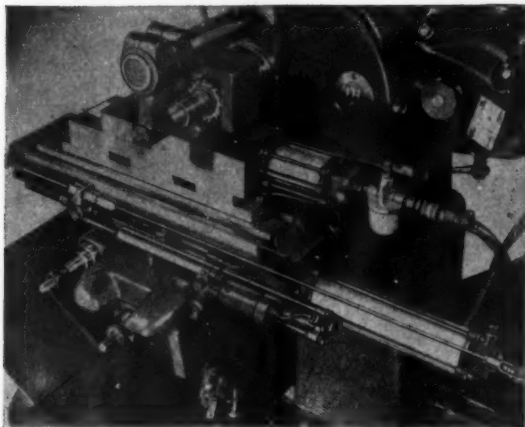


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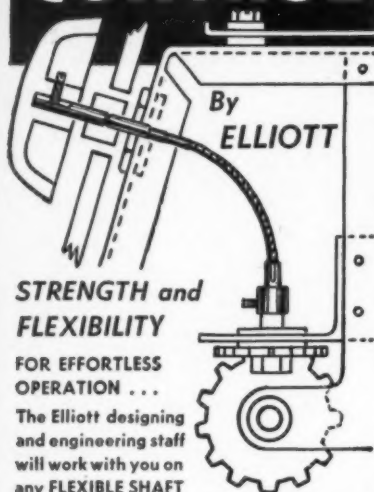
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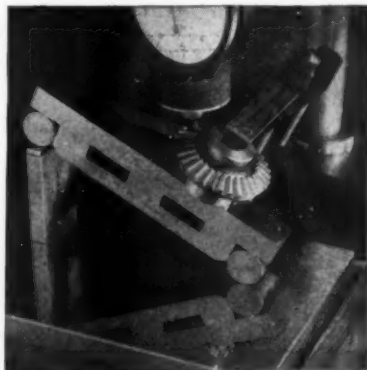
by it. The points to watch are these: Be sure after you have made the setup of the spindle heights with the sine bar, that you know the distance between spindle points. That means the actual distance, not the distance along the baseline. This will have to be measured by the most accurate means at your disposal.

Once the two dial gages, or comparator heads if the work to be done calls for comparator accuracy, have been clamped into proper position on the columns, all that is necessary is to pass the work, such as the angle plate or bevel protractor, under the two spindles until one of them registers zero. The drop or gain on the other one, divided by the distance between spindles, is the natural sine of the angle of error. (If neither dial registers zero, the difference in their readings is used.)

The same measurement can be done by putting a stop on one column and a dial gage or comparator head on the other. When the angle plate strikes the stop, if the angle is correct, the dial



Fig. 5—A setup for the checking of a bevel gear. You must watch all angles closely on these.





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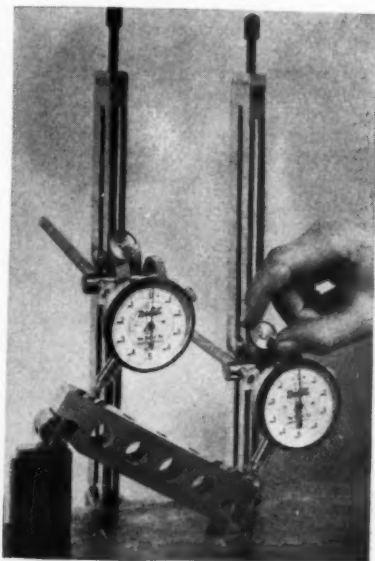
should register zero. If it doesn't, the amount of dial drop or gain, divided by the distance between spindle tip and stop, again is the natural sine of the angle of error.

Inspecting Bevel Protractor

It will have been noted in the preceding that mention was made of the inspection of bevel protractors by the angle comparator method. If there are many such protractors to be inspected, time usually will be saved by using the angle comparator for this work. However, this method checks only the one angle for which the comparator is set up. Bevel protractors, particularly the vernier type which is the more accurate and is therefore more likely

• • •

Fig. 6—Setup of an angle comparator, using dial gage heads. Comparator heads can be substituted if desired.



Taper	Required height in inches for gage blocks
$\frac{1}{8}$	0.052082
$\frac{1}{16}$	0.078120
$\frac{1}{32}$	0.104155
$\frac{1}{64}$	0.130186
$\frac{3}{128}$	0.156212
$\frac{1}{16}$	0.182231
$\frac{1}{32}$	0.208242
$\frac{1}{64}$	0.234246
$\frac{3}{128}$	0.260240
$\frac{1}{16}$	0.286223
$\frac{3}{128}$	0.312195
$\frac{1}{32}$	0.338154
$\frac{3}{64}$	0.364099
$\frac{1}{16}$	0.390030
1	0.415945
$1\frac{1}{4}$	0.519425
$1\frac{1}{2}$	0.622568
$1\frac{3}{4}$	0.725310
2	0.827586
$2\frac{1}{4}$	1.030485
3	1.230769
$3\frac{1}{2}$	1.427964
4	1.621622
$4\frac{1}{2}$	1.811321
5	1.996672
6	2.352941

Table No. 1.

to call for inspection to a high degree of accuracy, should be checked at several angles to make sure there has not been wear at some often used point, or that there is no cumulative error. To make half a dozen angle checks calls for half a dozen setups of the angle comparator, so it usually is better to make such checks by the following method, which is somewhat similar to that given in the section on inspection of the height gage:

First, the bevel protractor should be set at some convenient angle, under a good magnifying light, so the angle will be as accurate as you can make it. Then set the base on an accurately flat surface and clamp it there, if possible. Then construct a height gage with base block, holder, and gage blocks. With this also on the same surface as the protractor, measure the height of the protractor blade at some convenient point near its end. This height is factor

Taper	Required height in inches for gage blocks
$\frac{1}{8}$	0.026041
$\frac{1}{16}$	0.039062
$\frac{1}{32}$	0.052080
$\frac{3}{128}$	0.065099
$\frac{1}{16}$	0.078115
$\frac{3}{64}$	0.091131
$\frac{1}{32}$	0.104143
$\frac{3}{64}$	0.117155
$\frac{1}{16}$	0.130164
$\frac{3}{64}$	0.143170
$\frac{3}{128}$	0.156174
$\frac{1}{32}$	0.169174
$\frac{3}{64}$	0.182170
$\frac{3}{128}$	0.195164
$\frac{1}{16}$	0.208153
$\frac{3}{64}$	0.221155
$\frac{3}{128}$	0.234155
1	0.247155
$1\frac{1}{4}$	0.260155
$1\frac{1}{2}$	0.273155
$1\frac{3}{4}$	0.286155
2	0.299155
$2\frac{1}{4}$	0.312155
$2\frac{1}{2}$	0.325155
3	0.338155

Table No. 2.

h_2 . Then remove some of the gage blocks and measure the height of the blade again at some convenient distance down the blade, say 4 inches from the point at which you took the first measurement. This height is h_1 . The distance between measurements is the factor L.

Then, by this formula $\frac{h_2 - h_1}{L}$, you

can find the sine of the angle actually being measured by the protractor. This angle, when compared with that shown on the dial or the vernier of the bevel protractor, will tell you whether the protractor is measuring accurately or not. Five minutes is usually regarded as "standard" tolerance for the bevel protractor of the vernier type. The same procedure should be used, however, for the reasons given above, as several other points on the protractor vernier, so that more than one angle can be inspected.

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by

James R. Logan

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The effect of sound engineering practice is illustrated in the grinding of soleplate bottoms and edges which has

• • •

Kingsbury tapping machine—First step is this multiple unit machine which automatically locates, drills, taps and checks seven holes in casting.

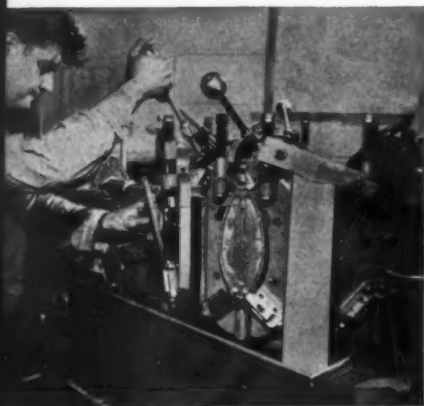
3,500 automatic irons are produced daily by General Mills, Inc. Their method of polishing and buffing soleplates is described in this article.

been reduced to a purely mechanical function. Combined with automatic drilling and tapping and fully automatic nickel and chrome plating, it has made possible the production of more than 4,000 soleplates daily.

These soleplates reach the Minneapolis plant as rough alloy castings. Bottom grooves, which accommodate working parts of the heat control mechanism, are hand-filed to eliminate rough spots, and "locating" holes are pierced with an air-operated automatic dual drill. These holes—one at the front, the other at the back of the soleplate—later serve as positioning guides during assembly and edge grinding operations.

Assembly perforations are automatically drilled and tapped in a single operation on a Kingsbury driller and tapper, and bottoms are ground on a Hanchett grinder, capable of handling 400 soleplates an hour. Essentially, the Hanchett consists of three rotary grinding heads, each driven by a 30 horsepower motor. The soleplates, held in place by magnetic chucks, are positioned beneath the heads by a rotating table accommodating 20 pieces at one time.

Grits of the three 8-segmented grind-





Hanchett grinder—More than 600 soleplates an hour are automatically ground and prepared for polishing and plating on this precision grinding machine.



Rotary automatic polisher—To assure a flat, perfect plating surface, soleplates are polished to a mirror-like smoothness in this automatic polishing machine.

ing wheels vary from 24 to 220, the first wheel removing from .025" to .040" of soleplate stock, the second wheel from .005" to .010" and the third from .002" to .005". The final finish is held to a 15 micro-inch maximum.

As each wheel is worn away, it is automatically fed down by sizers, maintaining constant pressure on the soleplate and consistent stock removal.

Grinding surfaces are cooled with a

standard coolant, cleaned by a Hoffman Clarifier which also services the edge-grinding operation.

Since the soleplate edges of General Mills Tru-Heat Iron are beveled around the entire periphery, edge grinding originally presented a difficult problem. The company hoped to avoid a hand operation, but it was unable to find an automatic machine tool capable of giving a smooth grind completely around

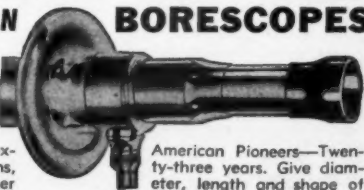
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Rotary automatic buffer—Finishing completed, the hard, scratch-resistant chromium finish is automatically buffed to a high brilliance in this multi-unit buffer.

an eccentrically shaped part. General Mills engineers solved the problem by designing and building an original grinder which has both reduced costs and speeded production.

Basically, its production and operation are simple. "Heart" of the machine is a Pope grinding head, powered by a 10 horse power electric motor which turns the grinding wheel at 1700 revolutions per minute. Since this head is mounted on ball bearings riding in V-shaped tracks, it is free to move either backward or forward. The carborundum wheel is of a cup-type, with 14-inch OD and 10-inch ID, the outside, lateral edge being used as the grinding surface.

Movement of the soleplate against the wheel is controlled by a cam the exact shape of the soleplate itself. This cam (which is connected to the fixture holding the soleplate by a steel shaft) operates against a flat metal surface set parallel to the face of the grinding



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wheel. Therefore, as the soleplate revolves, it follows the movements of the cam, assuring a smooth, even grind. A 100-pound weight, suspended from the free-moving head, forces the grinding wheel against the soleplate with a constant pressure, the amount of that pressure being limited by a simple stop-type adjustment screw. Edges are both rough ground and finished on the same type machine in successive operations.

General Mills polishes the edges by hand, using standard double jacks, equipped with 150 grit wheels for rough polishing and 180 grit for finishing. An automatic Udyelite polishing machine,

with three 180 grit heads, rough polishes the bottom, which is finished on a similar four-head polisher employing 220 grit wheels. Finally, the bottom and edges are hand polished on double jacks, using 220 and 160 grit wheels respectively.

Each soleplate is then automatically bright nickel plated, buffed, color buffed, chrome plated and chrome buffed. After a careful inspection of all surfaces, it moves to the assembly line where it joins the heating element, the Tru-Heat Control switch, the soleplate cover and handle.

NATIONAL TOOL SALVAGING SERVICE

The National Salvage Tool Company has issued a 20-page bulletin on the merits of salvaging cutting tools. One of the arguments advanced by the tool company in favor of salvaging tools is that it represents one way in which costs can be cut down, and therefore a way in which a company can meet present day competi-

tion. Toward this end, National presents a description, complete with photographs, of the various ways in which they re-point drills, recenter reamers, deepen reamer flutes, regrind pilots, etc. The book also demonstrates their work with carbide tipped tools.

Booklet may be obtained by writing Dept. BB, National Tool Salvage Co., 6511 Epworth Blvd., Detroit 10, Mich.

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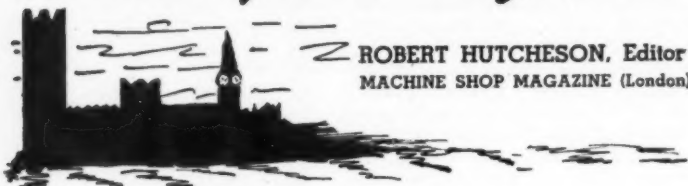


1033 PARMELE ST.

ROCKFORD, ILLINOIS

Write for copy of
our new bulletin
describing Beaver
Gear facilities
and methods.

Letter from England



ROBERT HUTCHESON, Editor
MACHINE SHOP MAGAZINE (London)

Without any doubt cutting off the electric power for five hours each day has eclipsed every other piece of news during the past ten days.

From 9 a.m. to 12 noon and from 2 p.m. to 4 p.m. practically the entire country is without electricity for power, heat and light for anything but essential services. All industry except food production and one or two other trades deemed essential to life are affected.

At the end of the first week many engineering and other firms stood off their workers. In doing this many of them were between the devil and the deep sea. Huge wages bills without any income would be crippling to many a firm and so seemed out of the question but, on the other hand, they fear that workers will seek employment elsewhere and so be lost to them.

Some works have been able to keep going where they had means for generating their own power. The large Loughborough firm of Brush Electrical rushed the erection of generating sets in their own works and in the works of one of their associated companies. Another firm is employing its engine-driven arc welding machines to supply current for running machine tools. Engine-driven generators from fair grounds have also been pressed into service by engineering firms determined to keep going.

Some two million people were put out of work straight away by the electricity cuts and, of course, many non-industrial workers while attending their places of business have had little to do, and working by candle-light does not make them feel too good about the fuel cuts. It is interesting to note that this moment was chosen for candles to be increased in price.

Shortage of coal at the generating stations is the cause of the trouble — brought about by the intense cold and snow. The cold weather has caused domestic and other users to make greater demands on the power stations while the snow—which has lasted for several weeks—has dislocated transport and

prevented the carriage of coal by rail and water. Coal supplies are again beginning to flow and this, together with the savings effected by the electricity cuts, is enabling the generating stations to build up their stocks to a safe minimum.

An Engineering Advisory Council has been formed to provide the Minister of Supply with a means of easy consultation with employers and workers in the industry on matters of general concern, with the exception of questions of wages and conditions of employment.

The field of engineering covered includes mechanical, electrical and radio but not ship building and the iron and steel industry.

The Council comprises eleven members representing employers, and eleven members representing the Trade Unions.

Mention was made in an earlier letter to the development of gas turbines for marine propulsion.

John Browns, the famous Clydeside shipbuilders who built the Queen Mary and the Queen Elizabeth, are reported to have two sets of gas turbines under construction. These engines run on heavy oil which is relatively cheap and for marine use they

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offer the advantage of other types of oil engine over steam in that boiler room space is not needed.

Other reports state that the Standard Oil Co. are having gas turbines built for a tanker.

Each year His Majesty's Chief Inspector of Factories publishes his report, and it always contains some interesting facts about industry viewed, of course, through the eyes of the Factory Inspectorate.

He mentions that workers, who during the war years were employed in modern factories, are now very reluctant to return to the old fashioned type of factory or mill with its lack of amenities for the worker.

This attitude on the part of the worker will make for the introduction of modern buildings to replace the older ones or the modernisation of old works.

Many works in the older established trades are beyond modernisation, but there are many others that can be improved greatly. Painting, cleaning and general tidying-up will do much to make some factories much better places in which to work. Guarding of machines, ventilation, fume and dust extraction, lighting and heating are all things to which greater attention

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PITTSBURGH, PA.

is being paid.

During the war there was a great extension of the works canteen idea, brought about largely by difficulties for night workers to obtain meals and for workers to get meals where new factories were in isolated districts, and there are now about eight times as many works canteens in operation than there were pre-war.

Industrial accidents that are notified continue to decrease.

More and more attention is being paid to factory safety in this country, and courses of training are held for safety officers. These courses are run for training new entrants to the field of factory safety and for refreshing those who are already safety officers.

Twenty-four lectures are given, the course is organised by the Royal Society for the Prevention of Accidents. The chairman of the course is H. M. Chief Inspector of Factories.

Lecturers are drawn from the Factory Inspectorate, from the Society and from industrial concerns having long and successful experience of organised factory safety.

One whole day in the course is devoted to the Industrial Museum in London where all kinds of safety devices are on

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BORG-
WARNER

1309 Eighteenth Avenue, Rockford, Illinois, U. S. A.

show and where sections are devoted to ventilation, lighting, noise suppression and numerous other aspects of industrial safety and worker comfort.

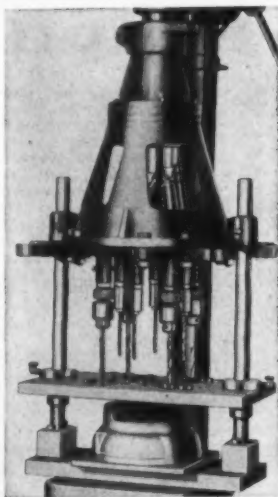
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Several factories have been started in various parts of the country by the Disabled Persons Employment Corporation to employ disabled persons. The Corporation was set up by the Minister of Labour under powers granted by Act of Parliament and so these factories, known as "Remploy" factories, have official backing.

The works will be established wherever there are sufficient numbers of disabled men and women to justify their starting. A total of eight will have been opened by the end of March, and by March, 1948, a further 40 will be in operation, with 30 nearing completion.

The factories will vary in size and provide work for up to 300 people. Each factory will operate as a separate unit, subject to general control by the Corporation headquarters.

Each factory will have its own management and staff, including a Manager, an Accounting Officer, a Welfare Officer, a Canteen Superintendent and a First-Aid Officer, as well as an Instructor for each class of work in which training is given.



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**INTERNATIONAL RESEARCH CORP.
659 S. Anderson St.
Los Angeles 23, California**

It is intended that smaller workshops shall be established in localities where there are smaller numbers of severely disabled persons, these workshops being attached to the nearest "Remploy" factory for management.

Linked with the factories will be schemes for home-workers whose disablement makes work in their homes more suitable than factory work. The factory will supply the material, tools and instruction; the product will be collected by the factory and the worker paid for the work done. In this way something like a chain of "cottage industries" will be built up round the "Remploy" factory.

Tasks given to home-workers will vary in accordance with the aptitude and capabilities of the man or woman concerned. Soft toy-making, weaving, silverwork, light assembly work, leatherwork and the making of table-mats and lamp shades, will be some of the items which are likely to prove suitable for those who will need to undertake employment in their own homes.

Only severely disabled persons who have registered under the Disabled Persons (Employment) Act are eligible for employment with the Corporation. The number of people eligible at the present time amounts to some 12,000, but it is believed

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that many more will come forward when facilities for employment are known to be available.

One important part of the Corporation's activities will be the arrangements for workers suffering from tuberculosis, and it may be necessary to establish hostels for housing them outside working hours.

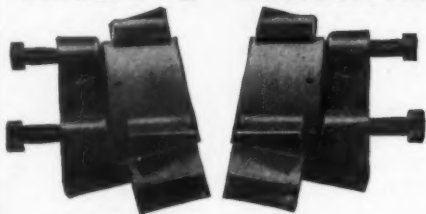
Factories will be set up for the tuberculosis wherever there is special need, and plans for one such factory are well advanced. It is hoped that this factory, which will be for post-sanatorium cases, will be functioning from 12 to 18 months' time.

It is intended, whenever possible, to work in with local industries, and it is hoped that sub-contracts will be received from local manufacturers.

The aim will be to promote good craftsmanship and to give the disabled the best type of work they are capable of doing.

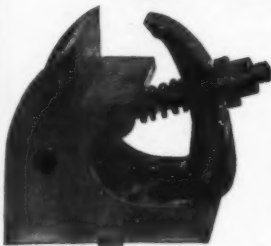
Wages will be based on recognized trade rates. In general, workers will receive about 70% of the trade rate at the commencement of training; about 80% after satisfactory progress has been made to enable employees to be engaged on productive work and the full rate when they are regarded as competent.

HART'S Machine Vise Jaws



These Jaws are useful on any machine table. The angle holding the work down. Suitable to clamp or bolt to table. The hardened tool steel jaw measures 3"x6"x1/2", the angle edge serrated.

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These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—to hold stock from 1/2 to 5 inches.

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ARE you denying dust control to operations such as this due to lack of space or isolated position of the machine? Roto-Clone, by combining the functions of exhausting, separating and storing of dust in a single unit, permits a flexibility of application to meet every situation.

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Application of individual Roto-Clone units to single machines solves line production problems, too. Long branch runs of duct are eliminated and equipment may be moved without redesigning a central exhaust system. But whatever your needs, there's a Roto-Clone Dust Control System that will do the job more efficiently at lower cost. Write for Bulletin No. 270-A.

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**ROTO-CLONE
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Chemical finishes applied to metals, as distinguished from protective coatings produced by electrical processes or the application of organic materials, have enjoyed remarkably rapid development in recent years.

Chemical Finishes Applied To Metals

Steel Finishing

OXIDIZING PROCESSES utilizing a low temperature salt bath are widely employed for applying a black protective finish on steel. The processing cycle itself is simple. First, remove all oils, greases, fabricating compounds, or dirt from parts to be blackened. This is usually accomplished either by solvent degreasing, or by alkaline cleaning. The latter may be performed by still-tank immersion or electrocleaning.

Secondly, after degreasing or cleaning, any rust, oxide or scale deposits present on work surfaces are removed by acid-pickling; after this parts are blackened by immersion in the oxidizing bath. Immersion time is dependent on the type alloys being treated; generally speaking, it ranges somewhere between 15 to 30 minutes. After thorough rinsing which completes the treatment cycle, the work is dried, waxed, or oiled.

Available today, under various trade names, are a number of oxidizing salts, which, upon dissolution in water, produce a blackening bath with an operating range of from 265° to 315°F. Some are used in a single bath, others are used in double-tank treatment routine. Control of the bath's color is effected thru manual or automatic means by the concentrations of the solution, with

water added at periodic intervals to properly compensate for the amount lost thru evaporation and dragout.

Selecting a steel-blackening process for use on a production basis often poses a perplexing problem because oxidizing agents frequently vary in characteristics. The majority of chemicals impart a satisfactory finish to soft, low-carbon steel; but there are some, however, which are less satisfactory when production schedules must be maintained. Moreover, the temperature range of some oxidizing agents is far more critical than others. Some oxidizing agents vary in penetrability which affects the rust-resistance and durability of the part.

Oxidizing salts are available in either powder or cake form. Powdered salts are made by mixing the chemical ingredients; cake salts are produced by fusing the component chemicals in a furnace and then casting them into coke molds. With dragout loss compensated for by periodic additions of oxidizing agents, replacement of oxidizing solutions usually is not required in average blackening bath treatment practice. Care must be observed that when the solution is operated beyond the temperature recommended by the manufacturer, the bath oftentimes is burned and

weakened, and is ruined if an excessive temperature is maintained for a prolonged period.

Contamination of solution is an occasional troublemaker, especially in cases where copper work racks or brass immersion baskets are employed or brazed parts are being processed. Alleviation of this particular problem requires a compound which neutralizes copper contamination without deleteriously affecting the oxidizing solution. For removing excessive accumulation of solids in suspension, one producer of black-finishing chemicals supplies, gratis, an

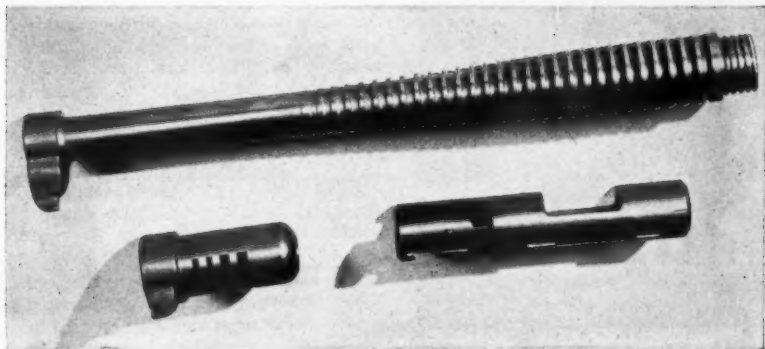
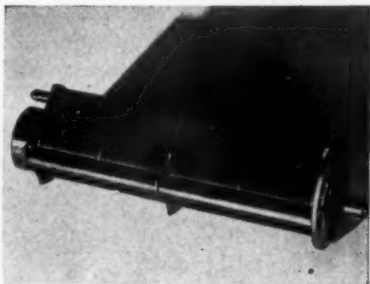
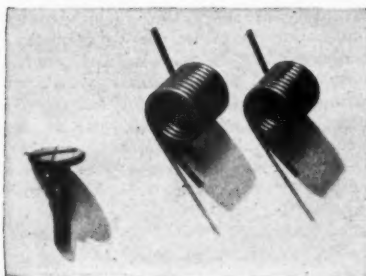
effective clarifier device to regular users of his oxidizing technique.

Besides providing a uniform finish with high penetration and the resulting increased durability and rust-resistance, certain non-critical, low-temperature fused salt oxidizing processes for steel are significant for still another reason. Because they do not cause practical dimensional changes in parts processed, even when parts are held to extremely close tolerances, no allowance is necessary for build-up.

The reason for this advantage is that the black oxide finish produced by these

• • •

A representative collection of parts which have been treated by the oxidizing process.



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proved processes is not a coating like an electroplate; instead, it represents a chemical change in the surface of the steel itself and, upon becoming an integral part of the surface structure, cannot chip, peel or blister.

During the early phase of the war, many aircraft engine manufacturers soon found that oxidizing treatments provided for rounding off the sharp corners present on even highly-polished steel surfaces as well as for producing a layer of oil-absorbent iron oxide. This resulted in lowering the coefficient of friction in close-fitting bearings. The subsequent use of a black-oxide finish of this type on steel bearings to prevent galling and scoring during break-in periods enjoyed a rapid and substantial growth.

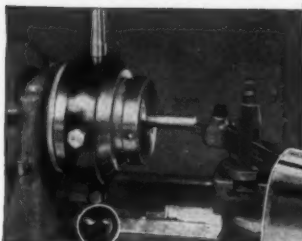
Where maximum rust-resistance and durability are important factors, many manufacturers utilize the dual-immersion treatment in place of the single-tank method for blackening parts of certain steel alloys and heat-treated parts. In this process, the work is degreased or cleaned, rinsed, and processed in one tank, rinsed, then transferred to the second bath operating at a temperature of 310°-315° F., where the work remains for the same period as in the initial treatment tank.

After this second phase of processing, parts are rinsed and oiled or dried in the regular way. In some applications the work is transferred directly, without intermediate rinsing, from one bath to another. And with the elimination of dragout in the intermediate rinse, an economy of salts is made.

Finishing Copper

Black-oxide finishing of copper, by no means new, and its alloys have become increasingly popular in recent years.

One step forward in the chemical finishing of copper and its alloys marks the recent development of a singularly improved process which now makes com-



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with many PLUS Features
Meets Today's Precision
Production Needs



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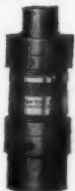


- Hand-operated self-locking selective adjustment ring maintains set predetermined pressures—assures solid grip on work.
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pletely practical the production of an excellent quality black finish with a minimum of difficulty. The coating which is produced protects the base metal to a high degree against corrosion. It is absorptive, also, with the result that oiling substantially widens the scope of its corrosion defiance; furthermore, the material reportedly serves as a top-notch undercoating for organic finishes.

While this comparatively new copper-oxidizing cycle is designed chiefly for copper, it has also demonstrated satisfactory results on copper alloys containing not less than 70 per cent copper. Actual blackening treatment is not complicated, consisting of the following relatively simple steps.

Surfaces must be clean; hence effective surface preparation is vital at the very outset. This is best achieved by either solvent cleaning or alkaline de-

greasing, after which the surface of the work is generally activated by acid bright-dipping.

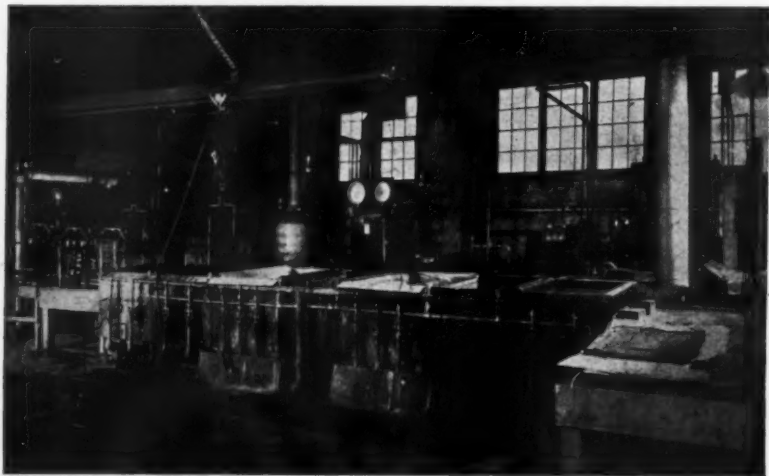
Next step is to blacken the work from 10 minutes to a half hour in a water solution made up with "Cu" salts, with the bath operating at a temperature between 140° and 200° F. Rinsing, drying, waxing, or oiling complete the black-finishing cycle.

Where a gloss black finish is required, it is recommended that parts be polished before processing, in which case no surface-etching is necessary. Experience shows, however, that a better black finish is produced on most work if parts are etched and a uniform crystalline surface is produced.

Thoro rinsing is important because as carryover of the acid-dip solution onto the parts tends to impair and destroy the blackening action of the "Cu" bath. A hot water rinse is generally employed

• • •

A typical installation in a large gun factory.



for drying down large parts, while tumbling in dust-free sawdust containing a "pinch" of oil is suggested for small-size work.

Blackening Brass and Bronze

Steady expansion in use of brass and bronze over copper parts in late years has brought with it a tough finishing problem which remained unsolved until recently. With the copper content of these alloys limited, satisfactory blackening was obtainable in most instances only after preliminary copper-plating. Even direct oxidation was found wanting in several cases because the alloying metal weakened the oxidizing bath, making frequent solution renewal imperative, thus sending finishing cost soaring.

After considerable research and ceaseless experimentation, one progressive manufacturer developed a pre-dip technique which, used in conjunction with the same copper-oxidizing se-

quence previously outlined, successfully blackened the majority of copper alloys without preliminary copper-plating as heretofore generally required. This development ushered in many notable advantages, two of the most significant being: longer life of the oxidizing bath, and faster finishing time.

To black-finish brass and bronze parts by this improved process, work is first properly prepared by cleaning and bright-dipping in line with usually followed methods, then subjected to a "Cuprep" dip for three minutes, during which time surface color of the work changes to dark gray or grayish-purple. Parts are then removed, rinsed and "Cu-treated." In this bath work oxidizes rapidly to the desired jet black. Standard sequence for rounding out the black-finishing of copper, already described, then follows.

Zinc Finishing

In addition to a number of processes,

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solutions of permanganates, chlorates, or molybdates, have been utilized for blackening zinc and zinc alloys. Of these, the latter have shown the most promise of success, with the simplest and most effective proving to be a salt buffered properly for stability yet still active enough to produce a coating of molybdenum sesquioxide on zinc or cadmium surfaces.

As with other chemical finishing treatments, thorough degreasing or cleaning is essential preparatory to oxidation by this method. Where work is alkali-cleaned, removal of all traces of cleaning solution is required to avoid alkali contamination of the blackening bath and upsetting its balance. A hot, followed by a cold rinse, is recommended. Surface preparation frequently includes scratch-brushing or greaseless-buffing prior to chemical cleansing.

After surface conditioning, parts are submerged for three minutes in the pro-

cessing bath, a water solution of the special molybdate salt operated at a temperature ranging from 140° to 200°F. When zinc-plated parts are to be finished, they should be blackened immediately after plating and rinsing whenever this is feasible since the work is in chemically-clean, oxide-free condition. But where immediate black-finishing is not practical, the work must be put thru the regular degreasing or cleaning cycle.

In the case of die castings, cleaning and pre-dipping comprise a dual requirement preliminary to immersion of work in the coloring bath. Should examination of blackened work show an imperfect coating due to impurities of the metal surface, acid-dipping and blackening of work are repeated. Immersion required to remove the remaining impurities generally does not harm the deposit of black. Upon coloring, work is dried, waxed, or lacquered according to individual requirements.

The resultant metallic oxide is an attractive coating that, thanks to its tenacious adherence and unusually good wear resistance, is satisfactory for many normal use-service conditions. It is not recommended, however, for constant exposure to the weather unless protected by lacquer. As a base for organic coatings, it inhibits chemical action between the final finish and the base metal . . . action which oftentimes causes blistering, peeling, and flaking when lacquer or paint is applied directly on zinc.

It should be pointed out, in conclusion, that black-oxide finishing problems vary considerably from one plant or shop to another. Hence, any shop or plant having trouble getting the satisfactory chemical finish desired will find it definitely worthwhile to consult a qualified technical service representative who is thoroughly familiar with the installation, operation and maintenance of blackening materials, methods and equipment.

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Littell makes a complete line of Automatic Reels, Feeds, Straighteners, Scrap Cutters, etc.

REQUEST BULLETINS

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4153 Ravenswood Ave., Chicago 13, Ill.

Use Of Betatron In Industrial Radiography

by
Jack T. Wilson

Physicist, Engineering Development Division, Allis-Chalmers Mfg. Company

AS WE approach a more intense program of manufacture, we see the need of using this instrument for inspection purposes and also for medical research and medical therapy.

The development of such a tool for industrial applications required an engineering program which would simplify the instrument and make possible its operation by an industrial radiographer who would not necessarily have a background of experience and training in the physics research laboratory. Fortunately, it has proved possible to do this and the instrument in its present stage of development may be operated by one person who will require only the assistance of others in handling the material which is to be in-

A maximum distribution of energy within the desired range can be best obtained by employing a betatron designed for maximum energies. The reasons for designing the betatron are discussed fully and authoritatively.

spected and placing it in the Betatron beam.

It is out of place at this time to review the preliminary biological evaluation of this device, but it may be said that it will give to the medical therapist a source of X-rays which produce their greatest ionization intensity and their greatest destructive effect in living tissue at depths below skin surface which are far greater than has been observed with low voltage radiation. We are certain that techniques will be developed using this instrument which will have



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many advantages when placed in the hands of the cancer therapist.

The accelerated program of armaments manufacture made necessary by the recent war has forced us to take the time to study the applications of the Betatron to industrial radiography.

A series of experimental models which have been used for investigations of absorption coefficients and experimental radiography has yielded data which makes possible a true evaluation of the Betatron when compared to other types of X-ray sources. We may take the absorption curve for iron for purposes of illustration and show that the minimum absorption of X-ray radiation occurs when the electron energies producing the radiation lie in a range between four and six million electron volts. As the energy of the electron stream increases, there is a gradual rise

in the absorption value which seems to be continuous throughout ranges of energy which have been explored. To the industrial radiographer, this means that a maximum of energy in the X-ray distributed in the ranges of 4 to 6 million electron volts will be most efficient and time saving in the radiography of thick specimens of iron, steel and various alloys.

An extended program of investigation has shown that a maximum distribution of energy within the desired range can be best obtained by employing a betatron designed for maximum energies of 18 to 22 million volts. Such instruments radiate energy in accordance with an intensity distribution curve which is high at the useful ranges of 4 to 6 million electron volts.

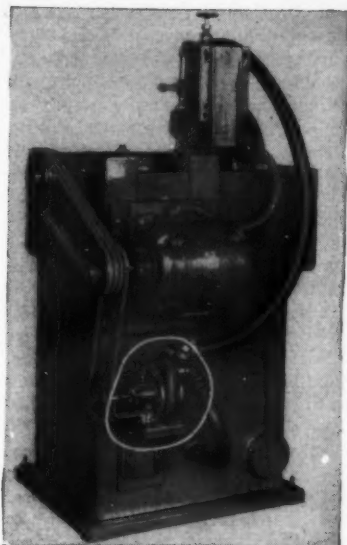
When the intensity curve of the 20

• • •

Inside this "donut" electrons spin around 300,000 times in about 1/720 of a second. The donut, the heart of the Allis-Chalmers 20 Million Volt Betatron provides the "racetrack" for the electrons until they spiral out to strike the target to generate X-rays powerful enough to take pictures through more than two feet of steel.

• • •





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million volt electron accelerator is compared with similar curves obtained from machines of lower and higher energy, we conclude that the 20 million volt machine combines the advantages of being practical and economical in its construction with a high yield of energy in the most useful range. An accelerator which is constructed for a maximum of 4 million volt electrons yields an intensity curve which shows a small amount of radiation in the desirable range with a rapid rise in intensity in the ranges which are more practically covered by standard X-ray radiators which are now used for radiography. The intensity curve of accelerators operating in ranges extending to 50 million electron volts show no significant gain in intensity within the critical range and the cost of constructing such machines make impractical their use for industrial inspection purposes.

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The high energy X-radiation emerging from the vacuum tube of a betatron is confined to a cone shaped beam. The electron energy determines the width of the cone and as the energy of the electron is raised, the cone of the useful radiation becomes more narrow and is limited to a smaller area. The useful radiation from the 20 million volt electron accelerators covers a circular area having a diameter that is approximately one-fifth the distance from the X-ray target to the specimen. Machines having lower energy characteristics will produce a wider area of useful radiation but they show the great disadvantage of producing the maximum portion of their energy within the ranges of the absorption curve in which there is a great amount of energy absorption and, as a result, very little energy reaches the X-ray film to produce the latent image.

This means that with low energy machines, we may expect longer exposure requirements and a limitation is placed on the thickness of the specimen which may be radiographed.

Industrial radiographers are familiar with the advantages of radiators which have small focal spots. A small point source of x-radiation will yield an image on the film which is sharply defined and distortions in the image of sections which are remote from the film are reduced to a minimum. It has proved practical to employ a target

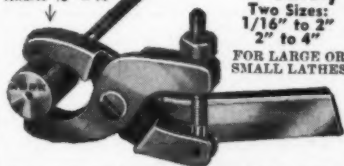
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which has a width of less than .010 of an inch in the 20 million volt electron accelerator and the length of an effective target may be estimated to be less than .008 of an inch. This is certainly the smallest focal spot which has been employed in industrial practice.

Conclusion

1. It has proved practical to employ the 20 million volt electron accelerator for the inspection of specimens of various alloys with a range in thickness between 4 inches and 18 inches. Copper alloys may also be successfully inspected.

2. Employing the most conservative techniques, exposure time requirements of 18 inches of steel will be less than 20 minutes and laboratory experiments have shown excellent results with high speed technique which yield satisfactory film in 6 minutes. The exposure time requirements for specimens ranging in total thickness from 6 to 14 inches



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Making final adjustments on the exposure Control Chamber of the 20 Million Volt Allis-Chalmers Betatron just installed at Picatinny Arsenal. The powerful X-rays pass through the Chamber on their way to huge loaded shells as they rotate on the conveyor ring in the foreground.

• • •



is less than 15 minutes.

The smaller focal spot of the Betatron makes possible a high order of definition of the radiograph. A sharp shadow is reproduced of those elements of the subject which are remote from the film and the interpretation of the radiograph is made very easy.

4. The 20 million volt Betatron has almost absolute sensitivity in that it will reveal the same sized flaw in a specimen regardless of the thickness of the specimen within the limits of the capacity of this machine. This means that a .030 of an inch crack or cavity may be detected through five inches of steel or through eighteen inches of steel.

5. The major portion of the energy of radiation is confined to the cone shaped beam, and this fact simplifies the problem of protecting the personnel in the

vicinity of the device. Adequate insulation may be provided by solid block concrete walls erected around the three sides of the machine and special heavy insulation is required only in the direct beam path.

In 1790 Samuel Slater built the first Arkwright-type cotton spinning machine in America.



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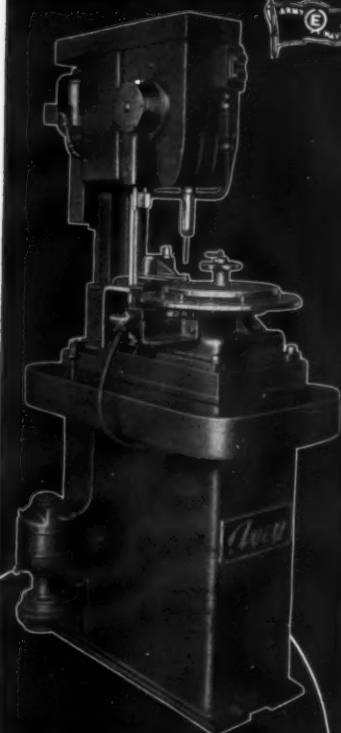
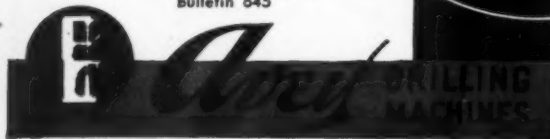
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By Invitation Number



News of the industry.....

1947 National Machine Tool Show To Be Held In Chicago, September 17-26

The first large Machine Tool Show to be held since 1935 will open its doors in Chicago on September 17 and last through the 26th. This will be the largest exposition entirely devoted to one basic industry. Featured at the show will be the latest designs in metalworking machinery, new production methods, latest materials, and every development which will increase the production and the quality of durable goods. Taking a realistic attitude toward economic problems and their interdependence, the theme of the show will be, "More goods for more people at lower prices."

Three previous shows have been held by the National Machine Tool Builders Association, sponsors of the coming show. These were held in Cleveland, Ohio in 1927, 1929 and 1935. Indicative of the interest in these shows is proven by the fact that during the 1935 show 60,000 technical executives and engineers came from every corner of the United States and from nations all over the globe.

The 1947 show will be housed in the gigantic Dodge-Chicago plant and will occupy 500,000 square feet. More than 250 exhibits of machine tools, metalworking machines and accessories will be exhibited by major manufacturers. To all indications this will be the largest exhibit ever held.

Admission will be by invitation only. Advance registration will be arranged by

the National Machine Tool Builders Association 10525 Carnegie Avenue, Cleveland, Ohio.

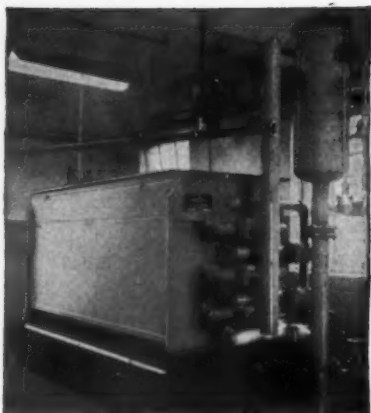
For the nine days of the show the doors will be open from 10:00 a.m. to 5:00 p.m. Technical sessions of the Machine Tool Congress will be held at various Chicago hotels, headquarters for participating organizations.

Directors of the National Machine Tool Builders Association are: Messrs. Herbert H. Pease, Alexander G. Bryant, Lloyd D. McDonald, Louis Polk, Harry W. Bockhoff, Albert M. Johnson, William L. Dolle, Fred W. McIntyre, Herbert T. Tigges.

Serving on the Machine Tool Show Committee are Messrs. Swan E. Bergstrom, Chairman; William L. Dolle, R. W. Glasner, Helge G. Hoglund, Ralph J. Kraut, Louis Polk.

U. S. STEEL WAGE TALKS

The U. S. Steel Corporation and the United Steel Workers of America are working on a new wage contract. The end of April marks the end of the current contract extension. Two factors affecting management and labor, respectively, will have a direct bearing on the progress negotiations—a substantial increase in the price of scrap and rising cost of living. Agreement is expected to be settled by the early part of April.



NIAGARA LIQUID COOLER Gives High Capacity in Small Space

Cold water, chilled to 33° F., or cold liquids, or non-freezing solutions below 32° F. are produced economically by the new Niagara Liquid Cooler.

For large capacity equipment it is most compact. For example, one model furnishes 92 G.P.M. of water cooled from 45° F. to 35° F., with 28° F. refrigerant, in less than 30 sq. ft. of floor space. Other models . . . 24 to 465 G.P.M.

Extra advantages: positive temperature control; assurance of holding temperature accurately in spite of variation in cooling load; rapid chilling of liquid; savings in power and refrigeration consumption.

Write for Bulletin No. 100-MT.

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AIR ENGINEERING EQUIPMENT

PORTER-CABLE SHARES PROFITS

For the second time since the end of the war the Porter-Cable Machine Company shared its profits with its employees. The first post war profit sharing checks were distributed in February of 1946, the second distribution was made recently, February 6, 1947 and covers profits made during the year 1946.

At the recent distribution \$86,000 was divided among the workers with individual checks averaging \$300. This is approximately 20% more per worker than he received in 1946. The increase in each check was possible in spite of the cloudy economic situation, rising prices, poor deliveries and strikes among suppliers.

According to D. J. Ridings, President of the Porter-Cable Machine Company the increased profit checks distributed in 1947 are a reflection of the increased productivity on the part of all the workers. Also noteworthy is the absence of labor strife at the Porter Cable Machine Company.

It is the belief of Mr. Ridings, a belief shared by other executives of the Porter-Cable organization that labor strife can be avoided and productivity increased with a sound human relations program. The workers must feel that they are a part of management even to the extent of sharing in the profits of the company. While a profit sharing plan should not be put into effect for the reason of raising production or reducing turn over or eliminating strikes, it should form the corner stone of an intelligent labor-management human relations program.

GULF CYCLOTRON OIL

Cyclotron Oil—another new development for the age of atomic energy—has been announced by Gulf Oil research laboratories. It is designed to withstand the catalytic action of the large amounts of copper used in cyclotron production of radio-active elements.

Initial application of the new oil is being made in the just completed cyclotron of the University of Pittsburgh, one of the world's largest. Here 467 gallons bathe the 18 miles of copper ribbon weighing 18 tons, coiled around the poles of a 90-ton electromagnet.

The cyclotron produces radio-active elements for use in medical and biological science and organic chemistry, is currently applied in treating cancer and leukemia, and is being expanded to broad industrial applications.

MODEL BELT CONVEYOR SYSTEM

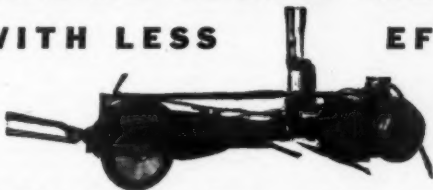
Chester F. Smith, Goodyear Tire and Rubber Co. belt engineer has demonstrated for the first time that complex belt conveyor systems can now be duplicated in exact miniature. Smith spent two years' spare time in his own workshop, designing and building the model which is constructed to 1/16 scale and powered by a small motor, 60 rpm. The component parts can be used to reproduce in miniature all types of belt conveyors. Equipment includes idlers, framework, belting, counterweights and a small stand of tires to cushion the loading impact.

For his efforts, Smith received Goodyear's maximum suggestion award of \$1,500.



The mechanism is ideal for engineering research, and Goodyear plans to use models for testing new belt designs, sales demonstrations and visual aids in training field representatives.

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Marschke Heavy Duty Swing Frame Grinders take the wheel to the work piece. They are massive to resist vibration . . . yet even the largest sizes give maximum maneuverability.

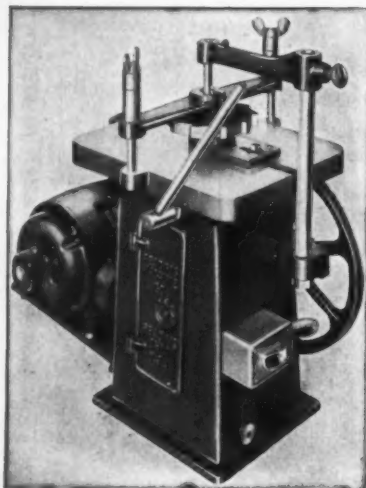
The wheel is easily tilted a full 90° right or left of the normal vertical position. Even in this position, Marschke Swing Frame Grinders are well bal-

anced in construction, longitudinally and laterally. This allows freedom in controlling the wheel angle to touch up various sides of castings as well as to follow a gradually curving contoured surface.

Marschke Swing Frame Grinders are available with wheel sizes of 16", 20" and 24". Write for further details.

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PLOMB TOOL BUYS J. P. DANIELSON CO.

The Plomb Tool Company, Los Angeles, announces the acquisition of the J. P. Danielson Company factory in Jamestown, N. Y., for the manufacture of pliers, adjustable wrenches and pipe wrenches. The Jamestown plant currently is making six pipe wrenches, eleven adjustable wrenches, and twenty-six pliers.

Established in 1906, the Danielson plant employs about 240 people, occupies 84,000 square feet and lies on a 4-acre site. John P. Danielson will continue as president of the plant.

NEW COMMERCIAL STANDARD

The U. S. Dept. of Commerce announces that Commercial Standard CS141-47 for Sine Bars, Blocks, Plates and Fixtures has been accepted by a satisfactory majority of manufacturers, distributors and users. The Standard will become effective, therefore, as a voluntary standard of the trade on August 15, 1947. Printed copies will be forwarded to each acceptor of record. Non-acceptors may write for copy to U. S. Department of Commerce, National Bureau of Standards, Washington 25, D. C.

LODGE & SHIPLEY AIR ELIMINATOR VALVE

CINCINNATI, OHIO—Development of a new industrial-use air eliminator valve for special application in steam-processing operations involving pressure up to 110 pounds is designed to increase efficiency in canning, rubber, food-processing and chemical industries, distributors and sales representatives of The Lodge & Shipley Company's Special Products' Risselt Division were shown at a recent demonstration.

The Risselt Division has designed and developed the new industrial valve which is now being manufactured and made ready for national and international distribution. Utility and facility of the industrial-use valves, known as the J-7, were explained by Risselt Division engineers at a two-day sales conference of distributors and sales representatives Feb. 6-7.

RIVET EXTRAS

The Champion Rivet Co. of Cleveland, Ohio, reclassified large rivet extras of diameters between $\frac{1}{2}$ inches to $1\frac{3}{4}$ inches, effective February 15. The new classification includes American standard heads, American standard rivet shank tolerances, and variations from these standards.

ELECTRICAL CONTROLS ENCLOSED ON BROWN & SHARPE NO. 5

To give maximum protection with accessibility, the electrical controls on Brown & Sharpe No. 5 Plain Grinding Machines now are fully enclosed in a compartment on the right side of the machine.

While the headstock, table, grinding wheel, and coolant pump are driven by separate motors, one dust and moisture proof main push button switch conveniently located on the control compartment at the right front of the machine, governs the starting and stopping of the whole machine.

The magnetic controls, individual motor overload relays, transformer for control system and main line disconnect switch are all mounted in the compartment on the right side of the machine. When the lever on the compartment door is turned to allow door to open, safety device operates the main line disconnect switch, and shuts off the current.



For further information, write Brown & Sharpe Mfg. Co., Dept. BB, Providence 1, Rhode Island.

YODER DIE CASTING PLANS NEW PLANT

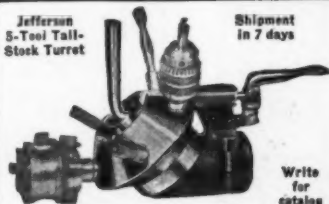
Yoder Die Casting, Inc. of Dayton, Ohio has announced plans for the erection of a new plant, according to Edison K. Yoder, president and treasurer. Construction is to start soon and occupancy is expected within six months.

The new building will contain 6,000 square feet of manufacturing space, be 40 x 130 feet and one story high, with construction of steel and reinforced brick facing.

CLINTON MACHINE TOOL BUYS EKLIND-LINCOLN MILLING HEAD

The Clinton Machine Tool Company, Incorporated of Clinton, Indiana (Manufacturers of the Clinton Hydraulic Duplicator—Clinton Atomic Mill and Special Hydraulic Machinery) have purchased from the Lincoln Tool Specialty Company of Chicago, all the manufacturing and sales rights of the Eklind-Lincoln Milling Head.

Jefferson
5-Tool Tail-
Stock Turret

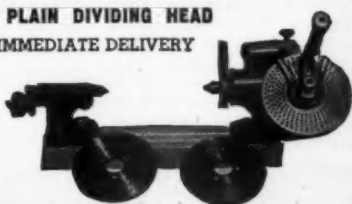


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**6" PLAIN DIVIDING HEAD
IMMEDIATE DELIVERY**



GENERAL ELECTRIC AWARDS 14 FELLOWSHIPS

Research fellowships totalling \$20,500 have been awarded to 14 graduate students by the General Electric Educational Fund, it was announced at Schenectady, N. Y., A. D. Marshall, secretary of the fund and assistant secretary of the company.

The awards are granted annually to graduates of universities, colleges and technical schools of the United States who have shown that they could with advantage undertake or continue research work in educational institutions either in this country or abroad. The fellowship recipients are granted an amount up to a maximum of \$1500 annually.

In all, 179 fellowships have been awarded since the beginning of the plan.

BREAK EQUIPMENT SALES RECORD

Industry bought more new industrial equipment during the fourth quarter of 1946 than at any other time in history. Most popular method of financing purchases was thru accumulated cash and current resources rather than thru bank loans or issuance of new stock or incurring debt.



**STANDARD
D-4
Abrasive
Band
Grinder**

Famous
for
Stamina

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

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L. S. STARRETT HOLDS SAFETY RECORD

At a mass ceremony at Athol, Mass., the Liberty Mutual Insurance Company awarded a special accident prevention flag to the L. S. Starrett Company for its safety record. The ceremony marked the close of the third year during which lost time accidents were held to a point 76% below the average for the tool manufacturing industry.

STUDEBAKER MEETS '28 RECORD

The Studebaker Corporation claimed the biggest month of production in its career since 1928 in January of this year, according to Paul G. Hoffman, president of the organization. Mr. Hoffman did not report exact production figures, but he did vouchsafe the information that production is still only half of what is planned for the future.

Procuring steel represents the biggest difficulty in the company's efforts to meet production schedules. They have had no strike in their 95 years of existence. Because management and union entertain a fairly informal relationship between each other, problems are dealt with promptly.



"I Want a Set of WALTON TAP EXTRACTORS

to get those d—d broken taps out," says the smart machinist. He knows a Walton will do the job faster, cleaner, easier and safer!

Inexpensive

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Milwaukee Wisconsin

PROTECT YOUR INVESTMENT IN CUTTING TOOLS



Make sure your machines use accurately ground tools to give you most profitable operation.

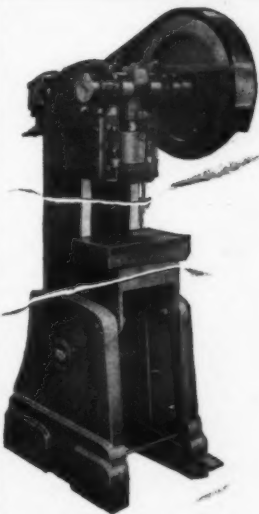
The LeMaire 3-Wheel Grinder provides the accurate means for obtaining and maintaining desired angles on cutting tools. Especially efficient for grinding Carbide-tipped tools. Two grinding wheels (rough and semi-finish) and a honing wheel run on sturdy, smooth-running spindles to produce the results you demand.

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LeMaire Tool & Mfg. Co.

2637 So. Telegraph Rd. Dearborn, Mich.

Designers and builders of unit and vvv type machines for single or multiple spindle drilling, boring, reaming, tapping, etc.—Twin Ram Hydraulic Units—Match-it Gear Checks.



THE U. S. 12 TON O.B.I. PUNCH PRESS

- ★ ALL STEEL FRAME
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CHICAGO 45, ILLINOIS

Shop Hints

LATHE ACCESSORIES STORED IN ALL-WELDED METAL CABINET

Greater efficiency in the successful operation of a modern machine shop was achieved recently when the Texas Company of Beacon, New York, built and put into immediate use an all-welded metal cabinet for storing lathe accessories.

The cabinet was designed by Mr. Raymond Lanari, assistant foreman at the Texas Company, and was found to be "just what was wanted" by men in the machine shop who found that storing of these accessories presented a problem that needed attention.

Design of the cabinet is simple, yet it incorporates strength and ample storage space for chucks and other lathe accessories when they are not being used.

The frame of the cabinet is made of $1\frac{1}{4}$ inch angle iron, which is covered with a $\frac{1}{8}$ -inch steel plate. Vertical shafts for the supports are made of 1-inch pipe, which are welded at the top and bottom. The angular supports for the chucks are welded to short sections of $1\frac{1}{4}$ -inch pipe which fit over the vertical uprights and ride collars that are welded to the smaller members. Wooden plugs to fit the chucks are fastened to the $\frac{1}{4}$ -inch steel plate supports.

The chuck supports provide a convenient means of storing chucks when they are not being used, and storing them in the cabinet keeps them clean and ready for use at a moment's notice. These supports, in another excellent facility, ride high enough that when the chucks are being interchanged, or stored, the operator does not have to stoop, but merely swings the chuck from the lathe to the supports or vice versa.

The lathe face plate and other accessories are stored in the bottom of the cabinet. Wrenches, collets and other small parts are stored in the top compartment which is wood lined.

Fabrication of the accessory-parts cabinet was accomplished by the use of electric arc welding with a Lincoln Electric

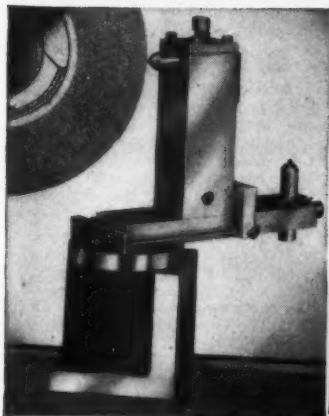
"Shield-Arc Junior" welder, and "Fleet-weld 7" electrodes.

All-welded steel cabinet for storing lathe accessories. Wrenches, collets and smaller parts are stored in the tray at the top of the cabinet, while the chucks are housed on the angular supports in the body of the cabinet.



PRECISION DRESSING AT LOW COST

with the "FORM-MASTER" ANGLE & RADIUS DRESSER



A sturdy, quality instrument. Designed by form-grinding specialists for accurate dressing of both angles and radii at low cost. Easily set with micrometer for radii—and with protractor or sine-bar for angles. All parts (except base) hardened and ground to close tolerances. Sealed ball-bearings for long-life and accuracy. Two 1/3 ct. diamonds and case included—\$150.00 complete.

Compare these features:

- Large range
- Chatterless and dustproof
- .0001" accuracy obtainable
- Simple to operate
- Reasonably priced

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Pat. Off.

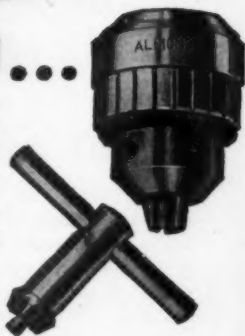
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J & S TOOL CO. 477 Main St.,
East Orange 2, N. J.
Manufacturers of "Fluidmotion" Form Dressers

ALMOND... *Triple Jaw* DRILL CHUCK

The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole—to fit all machine tools and portable tools.



Write for complete details.

**The Original
Manufacturers
of Drill Chucks**

T. R. ALMOND CO.

ASHBURNHAM, MASS., U.S.A.

PUTTING THE "MOTH BALLS" ON YOUR HEATING EQUIPMENT

By Ernest W. Fair

Winter is practically over and the machine shop's heating equipment will be used only sparsely throughout the forthcoming months so now is a good time for the shop's maintenance man to give closest attention to end of season care of the shop's heating equipment.

Here are a number of suggestions, culled from authoritative sources on steps which can be taken now to prepare heating equipment for next winter. All have been tested and proven in shop operation and represent "must" procedure for any alert machine shop management.

1. First step should be a thorough cleaning of the furnace, removing all dirt and scale from flues and fire box surfaces and removing all soot. Coal ash and soot will cause damage to the interior of any furnace if permitted to remain there.

2. Make certain the cleaning job is all inclusive; that no part of the equipment has been overlooked. The biggest damages occur when hasty spring cleaning leaves soot around to combine with the moisture in the atmosphere, this combination re-

sults in serious damage to the heating equipment.

3. It is inadvisable to use soda or any other alkali or any acids in cleaning operations.

4. All coal should be removed from the hopper and feed of stokers and stokers cleaned thoroughly.

5. There are a number of good methods of applying a moisture repellent to the heating unit surfaces after cleaning to retard corrosion. One of the least expensive and most effective methods is to spray heating surfaces, including grates and the ash pit with automobile crank case oil.

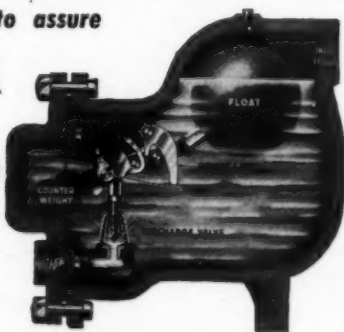
6. The operation of blowers and their motors should be checked thoroughly before the operation is completed. If it has been a particularly long season it may be advisable to have the motor thoroughly checked in an electric motor shop. Next winter will be no time to discover that the motor, the blowers or circulators are performing inefficiently.

7. Use lubricating oil liberally . . . be

Nicholson LEAK-PROOFS traps to assure

CLEAN AIR WITHOUT loss of pressure

A POSITIVE FLUID SEAL is a feature of all Nicholson air traps, eliminating troublesome loss of medium in discharge. OTHER FEATURES—Instantaneous action due to weight operation . . . Hardened stainless steel where it counts. Put a Nicholson air trap on a line and test their dependable protection against bleaching of parts and jamming of tools.



Nicholson Traps for Every Purpose: weight-operated, pressures to 1500 lbs.; piston-operated, thermostatic and expansion, for medium pressures.

Catalog 444 or See Sweet's

W. H. NICHOLSON & CO., 117 Oregon St., Wilkes-Barre, Pa.

sure to oil all door hinges, check valves closely, and oil all wheels and/or axles.

8. Warped, broken or worn out grates in furnaces should be replaced immediately.

9. All valves in steam distribution systems should be completely disassembled and checked for needed repairs and new gaskets. Make certain they are properly oiled upon reassembly.

10. On steam distributing systems it is a wise policy to drain and flush the entire system to prevent moisture collection at elbows and in low spots. This moisture can cause serious damage to pipes during the summer months.

11. Drain and purge the air from all radiators thruout the plant; whether steam or hot water. All valves on these radiators should be checked closely. Make certain the radiator coil itself will have free circulation when it is needed again.

12. If a paint job is needed do not hesitate to have it done; paint is one of our best guarantees against corrosion: let a fresh coat of rust proof paint care for idle equipment during summer months.

13. Fix definite responsibility for maintenance operations; typewrite a list of points to be checked showing exactly where each is located in the plant . . . have the maintenance man use this check list to guide him.

14. Thermostats should be checked at least once a year and this is the ideal time to have the job done; if the shop maintenance man is not thoroly familiar with the type used call in a qualified man. Good maintenance of thermostats is insurance they will perform perfectly next fall and winter.

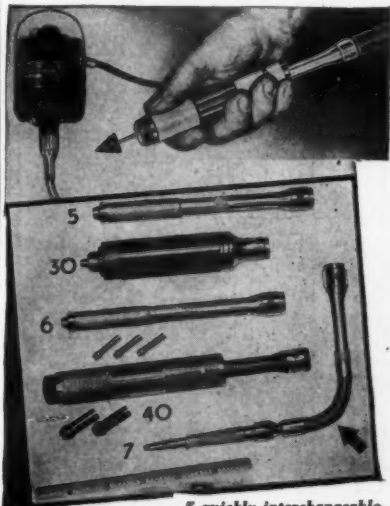
15. Check each thermostat location once again; the past seasons operations may have shown that some have been improperly placed. . . thermostats should always be located where there is sufficient air circulation to reflect the actual temperature changes in the area where they are located.

16. A detailed examination should be made of all piping, radiator vents, traps, etc. When a heating system operates at less than 100 per cent it is adding dollars to the plant's overhead costs.

17. Has the boiler or furnace been large enough to do an adequate job during the past cold months? If experience of this period has shown otherwise now is the time to start planning for enlargement or replacement of the present heating unit. Deliveries will take from three to four months today in most localities and that in some areas of the country will be bare-

• **How to Save Man-Hours in
Deburring and Finishing
of Small Parts**

• **FOREDOM FLEXIBLE SHAFT Machines**



5 quickly interchangeable handpieces types—pencil sizes and larger—some with flexible wrist—see arrow

- Pencil-size handpieces for the hard-to-reach places. Larger, ball-bearing handpieces for the heavier jobs, all quickly interchangeable. Flexible shafts which really ARE FLEXIBLE. Suspension models as well as bench models.

• **3 WAYS Right!**

- 1. For de-burring, grinding, finishing, polishing and other light production jobs—particularly valuable on irregularly shaped parts.
- 2. For grinding, finishing and touching up dies, molds, lugs, etc.
- 3. For touching up set-ups without disassembly, removing high spots on gears, identification marking of equipment, etc.

- Ask your mill supply dealer regarding FOREDOMS. If he cannot supply you, write us direct.

Write for Catalog No. 53

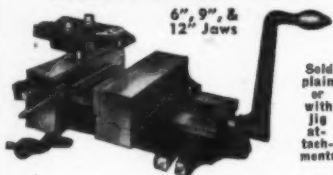
• **FOREDOM ELECTRIC CO.**

• 27 PARK PLACE NEW YORK 7, N. Y.

For shop tools
of **EXTRA**
USEFULNESS
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MULTI-PURPOSE VISE



Sold
plain
or
with
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at-
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ments

EXTRA USEFULNESS for hundreds of special-holding repeat-operation jobs, is found in this flush, parallel, square vise with numerous special jaws and attachments. Sizes up to 124 lbs.



All cut with **STRAIGHT KNURLS**



"Adjust-angle"
Knurl Holder

EXTRA USEFULNESS features this Knurl Holder which adjusts the angle of straight knurls to cut many different patterns on work up to 2 1/2" dia. "Passing-over-stock" type for quick run-back. Shank to fit your turret.

Request Price Bulletin 41

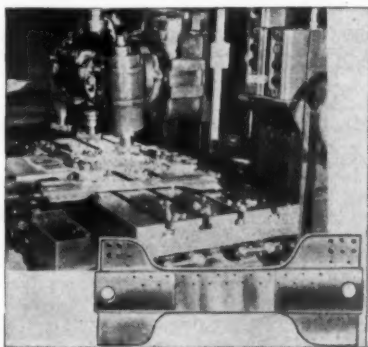
GRAHAM MFG. CO.
58 Bridge St., East Greenwich, R. I.

ly in time for the colder season.

18. If heating units are located in the machine shop basement run a thoro check to make sure water seepage has not started in that basement since it was last checked. If such conditions have arisen they should be permanently checked if possible; a temporary check only postpones inevitable trouble.

NEW PRODUCTION TECHNIQUE FOR ALUMINUM AND MAGNESIUM

A new and unique production service has been developed by the Aircraft Products Manufacturing Corporation, of Des Plaines and Wauconda, Illinois, for the rapid and accurate machining of aluminum and magnesium.



On the aluminum casting illustrated the elimination of 2 set-ups, 2 milling fixtures, 12" reduction in table travel distance, and 2 handlings, made a substantial reduction in costs. Part runs from 100 to 10,000 pieces or more, both simple and intricate, can be processed as readily.

The Hack Machine Company, through the development and building of a battery of special machines, with versatile, specialized, inter-changeable attachments eliminates many of the tools and fixtures used in the usual machining processes, saving up to 50% or more of tool and fixture cost.

On aluminum and magnesium parts, a sequence of operations such as surfacing, boring, milling and drilling can be carried out at one setting without disturbing the piece or holding fixture.

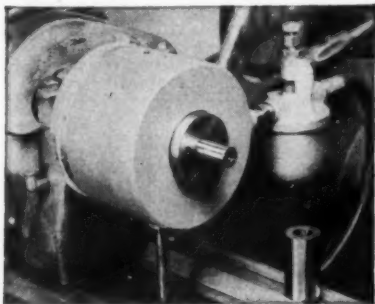
Special machines built by Hack permit the mounting of 4 heads on the master

head, at the same time. This makes possible the multiple production of up to four pieces simultaneously. By setting up the machine instead of the job— and through coordinating special combinations of heads with Vernier scales built into the machines, precise position of the part in relation to cutting tools is possible in all directions. This method provides jig bore precision between related surfaces whether drilled, slotted or milled. Inaccuracies resulting from transfer of parts from jig to jig are eliminated. This permits working to very close tolerances not possible when operations are done individually. Extremely difficult jobs not practical with usual machine tool equipment are handled accurately and speedily.

ERICKSON MANDREL

By using an Erickson 401AT39 air-operated mandrel, a lock manufacturer, holding a lock barrel rigidly, more than doubled production to over 4000 pieces in eight hours, on a turning-and-facing operation. According to the operators interviewed, fatigue was much less, especially because foot pedal control left both hands free.

The A-9 principle for design permits mounting the work and holding it at the extreme front end of the sleeve only.



Yet alignment is not lost, because it is insured by the pressure created against the back angle of the sleeve. This unique principle suits the Erickson A-9 mandrel particularly to blind hole jobs. Erickson guarantees an accuracy of .0005".

For further information, write to Dept. BB, Erickson Tools Division, 2309 Hamilton Ave., Cleveland 14, Ohio.

Hammond OF KALAMAZOO

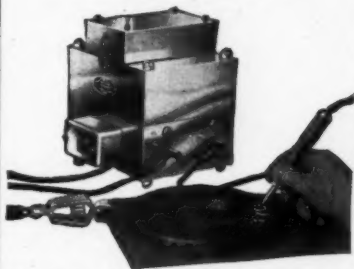


Eliminate costly hand filing, grinding, deburring and many other operations . . . There are "101" applications for the 400 in your plant. Write for bulletin.

Hammond Machinery Builders

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LUMA Master Etchtool



The master of them all. Meets every marking requirement in any shop. Has 24 stages of control for regulating depth of marking . . . from extra light to heavy. Will stand heavy continuous production on all kinds of metal, rough or finished. Write for details.

Luma Electric Equipment Co.
P. O. Box 132-H Toledo 1, Ohio

THRUST LOADS DUE TO DRILLING VARIOUS METALS
 Prepared by Canedy-Otto Mfg. Co.
 Chicago Heights, Illinois

CAST IRON						MACHINE STEEL				
Drill Size	Feed in Inches per Revolution									
	.001	.005	.010	.015	.020	.001	.005	.010	.015	.020
1/16	20	74	128	177	223	42	128	207	274	335
3/32	27	98	170	235	291	55	170	275	364	445
1/8	33	120	208	288	364	68	207	336	445	544
3/16	44	159	276	382	481	90	275	446	591	723
1/4	54	194	338	467	588	110	337	546	723	884
5/16	63	227	395	546	688	128	394	638	846	1035
3/8	71	258	449	621	781	146	447	725	961	1175
7/16	79	287	500	692	871	163	498	807	1070	1310
1/2	87	315	549	759	956	179	547	886	1175	1435
9/16	95	342	596	825	1040	194	594	962	1275	1560
5/8	102	369	642	888	1115	209	640	1035	1375	1680
11/16	109	394	686	949	1195	223	684	1105	1470	1795
3/4	116	419	729	1010	1270	237	727	1175	1560	1905
13/16	122	443	771	1065	1340	251	768	1245	1650	2015
7/8	129	467	812	1125	1415	264	809	1310	1740	2125
15/16	135	490	852	1180	1485	277	849	1375	1825	2230
1	141	512	892	1235	1550	290	889	1440	1910	2330
1-1/8	154	556	968	1340	1685	315	965	1565	2075	2535
1-1/4	165	599	1040	1440	1815	339	1040	1685	2230	2725
1-3/8	178	640	1115	1540	1940	362	1110	1800	2385	2915
1-1/2	188	680	1185	1640	2060	385	1180	1910	2535	3160
1-5/8	199	720	1255	1730	2180	407	1250	2020	2680	3275
1-3/4	209	758	1320	1825	2295	429	1315	2130	2825	3450
1-7/8	220	795	1385	1915	2410	450	1380	2235	2965	3620
2	230	832	1450	2005	2520	471	1445	2340	3100	3790
2-1/4	249	904	1575	2175	2740	511	1570	2540	3370	4115
2-1/2	268	973	1695	2340	2950	551	1690	2735	3625	4430
2-3/4	287	1040	1810	2505	3150	589	1805	2925	3875	4735
3	305	1105	1925	2660	3350	626	1915	3105	4120	5030
3-1/2	340	1230	2145	2965	3730	697	2135	3460	4590	5605

CAST STEEL						CARBON STEEL				
1/16	29	96	161	219	271	50	146	233	306	371
3/32	38	127	214	291	360	66	195	310	406	492
1/8	47	156	262	356	440	81	238	379	497	602
3/16	62	207	348	472	585	108	316	503	660	800
1/4	76	253	425	578	715	132	387	615	807	978
5/16	88	296	497	675	836	154	452	719	943	1145
3/8	101	336	565	767	950	175	513	817	1070	1300
7/16	112	374	629	855	1060	195	572	910	1195	1445
1/2	123	411	691	938	1160	214	628	999	1310	1590
9/16	134	446	750	1020	1260	232	682	1085	1425	1725
5/8	144	480	808	1095	1360	250	734	1170	1530	1860
11/16	154	514	864	1170	1450	267	785	1250	1640	1985
3/4	163	546	918	1245	1545	284	834	1325	1740	2110
13/16	173	577	971	1320	1630	300	882	1405	1840	2230
7/8	182	608	1020	1390	1720	316	929	1475	1940	2350
15/16	191	638	1075	1455	1805	332	975	1550	2035	2470
1-	200	668	1125	1525	1890	347	1020	1620	2130	2580
1-1/8	217	725	1220	1655	2050	377	1110	1760	2310	2805
1-1/4	233	780	1310	1780	2205	406	1190	1895	2490	3020
1-3/8	250	834	1400	1905	2360	434	1275	2030	2660	3225
1-1/2	265	887	1490	2025	2510	461	1355	2155	2830	3430
1-5/8	280	938	1575	2140	2650	487	1435	2280	2990	3625
1-3/4	295	986	1660	2255	2795	513	1510	2400	3150	3820



**If you want
MORE PARTS per hour
LOWER COST per part**

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Write for bulletin 201 today



**—Chuck Division
THOMAS HOIST CO.
24 S. HOYNE CHICAGO 12**

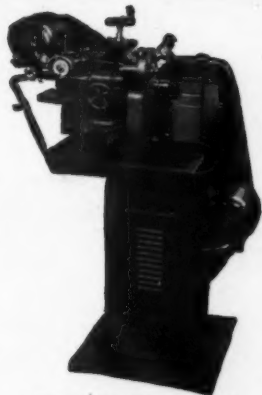
... office boy can grind precision flutes with 50F

Especially designed for automatically fluting, taps, reamers, drills, milling cutters

- ★ Grinds flutes in small taps and reamers from solid
- ★ Regrinds milling cutters
- ★ Regrinds angular cutters
- ★ Sharpens small saws in gangs up to 3 3/4" long

Wide range of special applications

Write for Bulletin 50F.



**Fully Automatic Universal
Flute Grinder**

THE WARDWELL MANUFACTURING CO.
3165 Fulton Road, Cleveland 9, Ohio

WHAT'S NEW IN METALWORKING

PORTER-CABLE ABRASIVE BELT CENTERLESS GRINDER

One of the most important recent developments in wet belt machining is the perfection of a centerless grinder, announced by the Porter-Cable Machine Co., Syracuse, N. Y. This grinder performs on round stock as well as the standard machine performs on flat and slightly curved pieces. A collection of stock finished by the centerless wet belt grinding method is shown in Fig. 1. In Fig. 2, operator is finishing the O. D. of stainless steel tubes, about .005" of stock is removed from each tube. The change from a roughing to a finishing operation was cut in half, because only the belt needed to be changed. In addition to this, there is but one regulating feature, which drastically reduces set-up time.

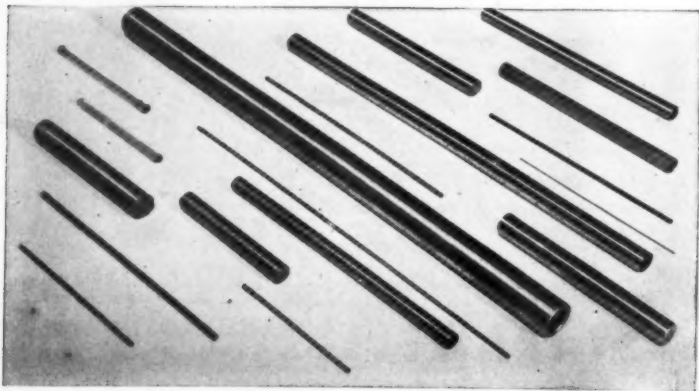
An endless abrasive belt operates over a resilient contact roll. Since the abrasive belt and the contact roll are bal-

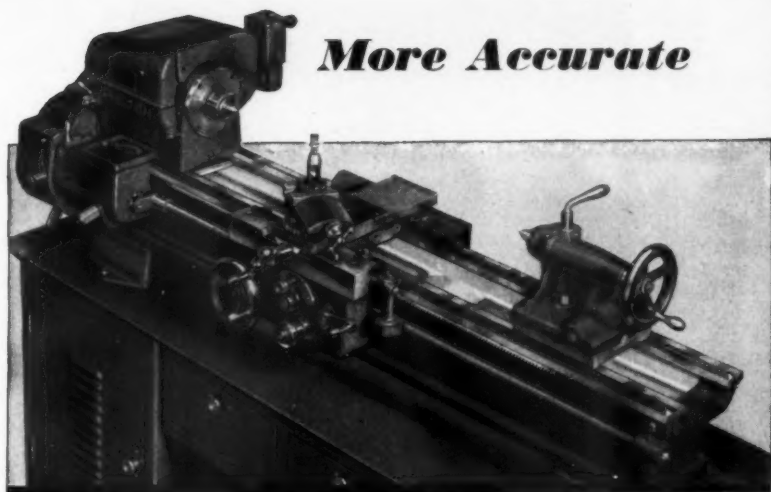
anced, the two cut uniformly. The work is done by the abrasive belt; therefore, the contact roll gets little, if any, wear. This roll, which backs up the abrasive belt, therefore remains flat across and square at the corners. Its diameter remains constant. This condition eliminates much truing and balancing. Changing abrasive belts on this centerless grinder is as easily and quickly done as on any abrasive belt machine. Seldom is it necessary to true up.

Since the grinding unit maintains a balanced condition and the contact roll remains flat and square, setting up is simplified so that less experienced men may handle the job. In addition a swivel head is provided and when necessary the contact roll is trued up on the machine itself and in its normal position.

The resiliency of the contact roll eliminates chatter. A soft resilient roll follows a shape and cleans up irregular stock.

Fig. 1: A collection of tubes and bars finished by the wet belt centerless grinder. The resiliency of the wheel allows for bent tubing and irregularities in the O.D. The belt follows the contour of the work.





More Accurate

SHELDON

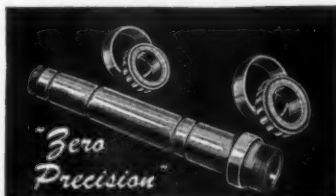
New TRB-S56

Precision Lathes

There is a degree of accuracy built into the new \$1000.00 Sheldon TRB-S56 Precision Lathe heretofore found only in a few of even the most costly lathes. For example, spindle bearings are "Zero Precision," the very finest, closest tolerance tapered roller bearing manufactured. The heavily strutted, 1-piece bed has 2 V-ways and 2-flat ways ground on special bed grinder and held to the closest tolerance of lateral and parallel alignment. The lead screws are milled on the most accurate special lead screw milling machine.

In the Sheldon TRB-S56 modern engineering, extensive tooling combined with the finest special machinery—a modern machine tool plant with modern equipment, modern manufacturing methods—give this small (11¼" swing, 1" collet capacity, 56" bed, 8 speed—50 to 1350 r.p.m.), convenient, moderate priced lathe, the permanent accuracy and features, heretofore found only in more cumbersome and costly lathes.

Write for circular



SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4242 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.



Fig. 2: The operator is finishing 2 1/4" tubes, which are held to a tolerance of .0005". It is interesting to note that the changeover from rough grinding to finish is accomplished in a matter of minutes. All that is required is to change the belt from a coarse to a fine grit.

• • •

Semi-hard roll is recommended for accurate grinding.

This new centerless grinder handles a variety of operations and a popular range of sizes. It is adapted for thru work, short pieces, 3/4" to 2' lengths and longer, of course, with proper supports. Diameters handled range from 3/32" to 2 1/4".

One interested in safety must appreciate the fact that this has been cared for in the latest centerless. An abrasive belt simply drops off the machine when it breaks. Furthermore, grinding is done below center to avoid throwing work out of the machine.

The usual advantages of their wet belt machining are inherited by the latest Porter-Cable unit. The work remains cool, thus avoiding distortion, discoloring, warping, and the abrasive belt, while comparatively inexpensive, runs cooler, does not load and therefore lasts a surprisingly long time.

The advantages of quick set-up, ease of operation, and capacity and popular price open new markets for a centerless grinder

as supplementary equipment to handle shorter runs where large machines are employed; in manufacturing where investment, because of volume, is a factor, and in the jobbing machine shop where it will handle many of the centerless operations economically and thus increase profitable volume. For further information, write Porter Cable Machine Co., Dept. BB, Syracuse, N. Y.

ELECTRO MECHANO DRILL PRESS

The Electro Mechano Co. of Milwaukee has released a 6-page folder describing their 8" precision bench drill presses.

Four models are pictured and described. Features emphasized are Speed Right, the ability to set drilling speed instantly according to material and drill, and Selective Quill Feed, the ability to adjust drilling sensitivity through use of their Micro-feed, particularly useful in slower feeding.

Write to Dept. BB, The Electro-Mechano Company, 261 E. Erie St., Milwaukee 2, Wis. for folder.

MULTI-OPERATION CHUCKING MACHINE ANNOUNCED BY HARDINGE

The Multi-Operation Chucking Machine is an entirely new machine just announced by Hardinge Brothers, Inc., Elmira, New York.

The universal acceptance of the Hardinge Second Operation Machine by production departments divulged the need for a precision machine to handle relatively small work. It was found that a need existed for a precision chucking machine to handle large diameter work. Further, the machine would have to produce work to accuracy that heretofore was associated only with smaller diameter work. This meant an entirely new machine which, through development, became the Hardinge Multi-Operation Chucking Machine to fill the gap which existed between the Second Operation Machine and large turret lathes.

The Hardinge Multi-Operation Chucking Machine is for turning, boring or threading parts up to 6" in diameter which have been blanked out on automatic screw machines or turret lathes or for finishing stampings, castings, forgings and many other types of work that ordinarily require many individual set-ups. Typical examples are the many parts requiring threads to be cut concentric with turned or bored diameters, as well as square and true with shoulders on the work. Machining such parts would otherwise require planing, the applying of skilled operators and many separate machines and set-ups. Parts requiring many bored diameters and turned diameters that must be relatively concentric, as well as having a fine finish, can be produced on a rapid production basis on a Multi-Operation Chucking Machine. The eight-position turret and the production threading head use standard tools, making simple set-ups permissible for low cost tooling and low set-up costs for short runs. The eight-position turret permits greater tooling possibilities as you can recall many instances where you were handicapped with a six-position turret. Also, the precision threading unit is separate, which is equivalent to adding a position to the turret for other tooling. The proper speed range of the preloaded ball bearing headstock affords maximum rigidity and, when combined with the power-driven carriage, the machine is ideal for precision boring.



Front view Hardinge Multi-Operation Chucking Machine.

Some of the features of the Hardinge Multi-Operation Chucking Machine;

HEADSTOCK: The headstock spindle has a speed range of 150 to 3000 rpm in either the forward or reverse direction. The spindle takes standard 5C Collets, providing a 1" round collet capacity thru the spindle. Step Chucks provide collet-like chucking of work up to 6" in diameter. Through the use of two, three or four jaw chucks, odd shaped castings, stampings and forgings may be chucked.

PRODUCTION THREADING HEAD: The production threading head is controlled by a precision master lead screw mounted directly on the rear of the headstock spindle. There are no intervening gears; therefore, accurate duplication of the lead screw is assured. Threading on the Multi-Operation Chucking Machine is done at speed usually only associated with turning operations. For example, 1½–20 threads are cut in steel at 500 rpm. A 3" diameter 24 pitch thread is cut in an aluminum die casting at 1500 rpm. It is not necessary to cut a thread relief in the work as the thread length control



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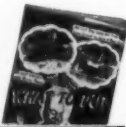
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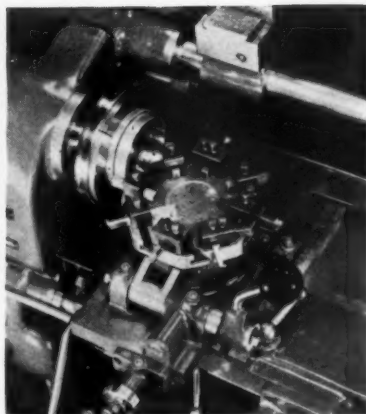
Canadian Office: 21 King St., E., Toronto.

Please send me complete **INSTANT-USE** information . . . details of **TRIAL ORDER PLAN**—no obligation.

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Close-up view Hardinge Multi-Operation Chucking Machine turning a large diameter part. Note: The use of standard step chucks for holding the part. The use of simple standard $\frac{3}{8}$ " square tool bits and that the turret works right up close to the work. This eliminates long springy tooling—means greater accuracy.

• • •

automatically lifts the tool from the work at the end of the cut. Threads can be cut within one-half turn from the shoulder.

BED: The bed has hardened and precision ground steel dovetail ways. The dovetail bed design is the same as used on Hardinge Precision Tool Room Lathes and Second Operation Machines. The dovetail way design is superior to other types of ways in that the forces resulting from the work cutting load apply a holding-down action which eliminates chatter and vibration.

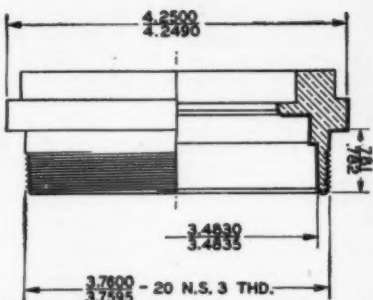
CARRIAGE: The carriage of the Hardinge Multi-Operation Machine is of generous proportion but yet sensitive enough to give the operator an unusually fine "feel", an absolute necessity when machining to precision tolerances. The carriage has a built-in cross feeding turret which permits work to be bored, turned and faced from the turret with extremely short length tooling. This is possible because the face of the turret can be brought right up to the work which eliminates long springy turret tooling—

assuring maximum accuracy. The cross feeding turret can be either screw fed or lever fed.

TURRET: The turret has eight stations and the desirable feature that each turret station can be adjusted without affecting other turret stations. This built-in feature is not found in other machines. The adjustable turret station feature is for final adjustment of the cutting tools without resorting to the old-fashioned method of hammering tools for size adjustment. The turret takes standard $\frac{3}{8}$ " square or $\frac{3}{8}$ " by $\frac{3}{8}$ " rectangular tools directly on the hardened and ground steel top surface. Thru the use of single, double and triple tool holders, as high as twenty-four single point tool operations can be performed in one set-up.

The machine is supplied complete with welded pedestal which has a motor compartment in the left-hand side and a tool storage compartment in the right-hand side. The coolant facilities are an integral part of the pedestal base. The coolant pump is individually motorized.

The features of high spindle speed pre-loaded ball bearing spindle construction, coupled with the eight-position cross feeding turret and production threading head, allow extremely close tolerance work to be performed in one chucking



Typical part requiring the machining of twelve surfaces in addition to threading operation. The surfaces are all finished with single point tools—the most accurate method of finishing.

that would ordinarily require several subsequent operations.

Write to Hardinge Brothers, Inc., Elmira, New York, Dept. BB for bulletin HP—free upon request. The bulletin gives typical examples of work being machined, detail description of various units and specifications.

MILLING

BURKE

MACHINES



Above: No. 4 Motor Driven Milling Machine. Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

FOR SMALL, DIFFICULT WORK ON A PRODUCTION BASIS . . .

GENERAL SPECIFICATIONS

Mach. No.	Working Surface of Table	Longitudinal Feed	Traverse Feed	Vertical Feed	Maximum Distance between center of spindle and table
1	3½x12	8	3%	4½	3½
2	3½x16	6	2	4½	5
3	3½x12	8	3%	7½	7½
4	3½x16	8	3	8	8

Write TODAY for complete information, specifications, attachments not shown in above table.

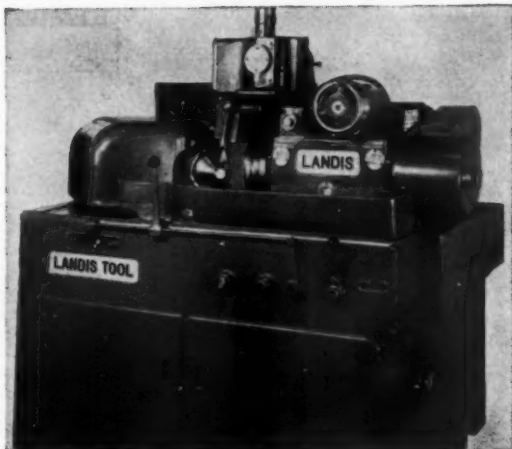
BURKE MACHINE TOOL CO.
510 Sandusky St. Conneaut, Ohio

LANDIS TYPE H VALVE GRINDER

The Landis Tool Co., Waynesboro, Pennsylvania, announces a completely new type H valve grinder. Automotive and airplane valves are ground to an exact seating surface. The manufacturer claims a low operator fatigue factor at the same time increasing production because "down time" is less.

The machine handles valves with face angles 0° to $62\frac{1}{2}^{\circ}$ and face diameters of $\frac{7}{16}''$ to $3\frac{1}{4}''$; the Microsphere bearing headstock uses collets or V-blocks for chucking and clamps hydraulically. Loading and unloading may be done with the headstock spindle rotating or it may be cycled to stop when grinding is completed. The headstock is mounted on a fixed table which provides support for the full swiveling range.

The wheel spindle is mounted in Microsphere bearings also; reciprocating movement is adjustable from $0''$ to $\frac{1}{2}''$. Stand-



ard and wheel size is $20'' \times 1'' \times 8''$; wheel drive motor is 3 hp.

The hydraulic oil reservoir contain 32 gallons and the coolant reservoir 42 gallons. The machine weight is 8700 lbs. Write Dept. BB. Landis Tool Co., Waynesboro, Pa.

THE DENVER UNIVERSAL FLAME HARDENER

Heat treatment has entered a new era with the introduction of the flame hardening process. This employs the intense heat of the oxy-acetylene flame plus an automatic quench, and opens up new horizons of control refinements, as well as effecting great economy in heat treating costs.

Successful flame hardening necessitates precise hardening of the wearing surface, leaving the core of the material at pre-hardened strength without distortion. Depth of hardening is accurately controlled up to $\frac{1}{2}''$ deep, depending upon the requirements.

In contrast to the conventional heat and quench method of heat treating, parts to be flame hardened are completely machined, regardless of exacting tolerances, prior to the operation without danger of scaling or distortion.

Some features showing the flexibility and versatility of the Denver Universal Flame Hardener are: 1. Adjustable Cen-

tering Device—which will accommodate from 1 inch to 8 inch diameter. 2. Flame Travel can accommodate up to 6 ft., and up to 12 ft. length by turning end for end. 3. Hydraulic System and Flame Control Panel—vertical travel is hydraulically controlled and is infinitely adjustable from 0 in. to 20 in. per minute with a rapid travel by-pass valve. Oxy-Acetylene flame is accurately controlled from panel or by remote control hand switches, as well as through automatic timer. 4. Adjustable Column—which can accommodate up to 6 ft. diameter on the work table. Larger diameters can be accommodated when column unit is removed from base. 5. Variable Speed Work Table—speeds from .42 rev. per hour to 468 rev. per minute in 36 steps. Stepless control is also available.

The Denver Flame Hardener was designed in relation to the three basic methods of the flame hardening process. These methods and the products suited to such specific techniques may be briefly discussed as follows:



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If you're faced with small riveting operations — the kind you need in a hurry — a Linley Series 10 Machine will do the job at the rate of **one rivet per second!** Available in both floor and bench models, with 3/16" diameter capacity . . . horizontal or direct-connected vertical motor. Other models with same features for 1/4" and 3/8" capacities.

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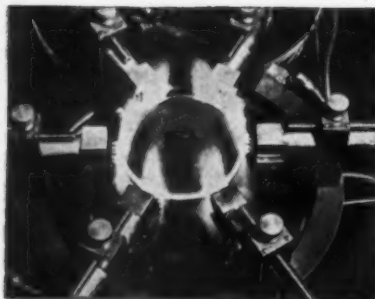
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1. Progressive Method of Flame Hardening.

In flame hardening by the progressive method the work remains stationary and the flame head moves, or the reverse of this may be called for. Examples of work suited to this technique are the hardening of the work face on traction wheels, spur, helical, herringbone gears and worms, car wheels, pulleys, and bearing races, as well as cutter blades, clutch

plates and rollers. Circular pieces over 6" diameter would in most cases be handled by this method.

2. Spinning Method of Flame Hardening.

In flame hardening by the spinning method the work turns rapidly and the flame heads remain stationary. Suited to this technique are products such as gears, saws, cutters, small car wheels, small rollers, pins, and localized hardening on spindles. Work from 1" diameter to 6 feet diameter is within the capacity of the Denver Flame Hardener.

3. Combination Method of Flame Hardening.

The combination method combines the progressive and spinning methods with the result that the work rotates and the flame head travels up, followed directly by the water quench. Examples of work suited to flame hardening by this method are shafting, cylinders, pump liners, bores, and spindles. Deep bores up to a 3 foot depth and shafting up to 12 feet long are within the range of the Denver Flame Hardener.

The Model 20 Denver Flame Hardener was formally shown for the first time at the recent National Metals Show in Atlantic City, by the Stearns-Roger Mfg. Co., Denver Colorado, pioneer manufacturers and designers of machine tools and industrial equipment.

Henry Moss Co., B'klyn, says, "Air-Hydraulic Press put us on mass production basis."

Air-Hydraulic Press driving 3 Parker-Kalon No. 10 drive screws with button head simultaneously. Previously each screw was driven separately.



AIR-HYDRAULIC PRESS SPEEDS ASSEMBLY, MARKING, FORMING, ETC.

2 Models—2½ and 6 ton capacities

Henry Moss Co.'s chief engineer says, "... Air-Hydraulic Press cut our costs, increased profits. Also it enabled us to make a better iron." Air-Hydraulic Press can eliminate your production bottleneck, too, whether you work in metal, plastics, or leathers. 2 sizes—up to 2½ and 6 ton pressures, floor and bench models. Just attach to your present airline.

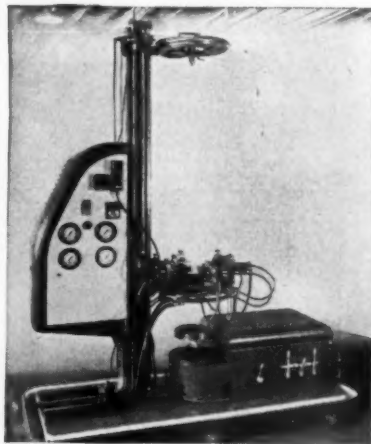
Ask for illustrated catalog. A few distributorships open. Inquiries invited.



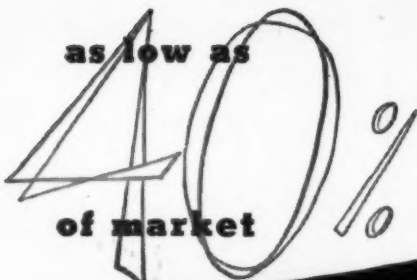
AIR-HYDRAULICS, INC.

Farmington, Michigan

Sales Office: 401D Broadway, N. Y. 13



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SURPLUS RESISTANCE WELDERS

RESISTANCE SPOT WELDERS:

TYPES AVAILABLE: Rocker Arm, Press, Portable or Gun, and some Multi-Electrode types, in well-known makes. Motor, air, hydraulic or manual operation; rated from 10 to 400 KVA; 220-440 volt, 60 cycle, single phase; throat depths 6" to 48"; synchronous and non-synchronous.

CONDITION: Mostly used, some unused.

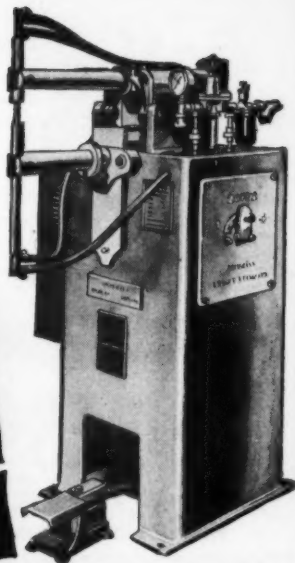
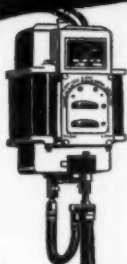
RESISTANCE SEAM WELDERS:

TYPES AVAILABLE: Longitudinal, Circular, and Universal; also Multi-Electrode types.

RANGE OF SPECIFICATIONS AND CONDITION: Same as Spot Welders.

OTHER TYPES: Butt and Flash resistance welders; and Stored Energy Spot Welders up to 50 KW and 48" throat depth (also a few machines of greater capacity).

All welders are sold under existing priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area, and then to purchase the materials offered herein.



Manufacturers can buy at a very low percentage of present market costs resistance welding equipment built by the leaders in the industry. This equipment is now available for immediate delivery and can be put right into the production line.

This equipment can be inspected at most Regional Offices, but the large inventories are located at:

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Write to these Regional Offices asking that your name be added to the mailing list for this type of equipment.

EXPORTS: Your business is solicited. Any inquiries regarding export control should be referred to the Office of International Trade, Department of Commerce, Washington, D. C.



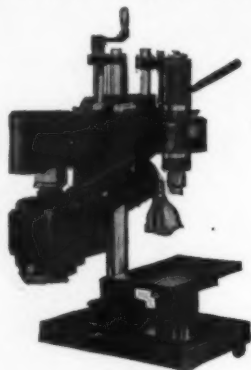
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Hamilton Small Hole, Super-Sensitive Drills have many exclusive, patented features. Your small holes, .004" to 5/16", can be produced by these machines accurately and rapidly . . . and at less cost per hole.

Especially adapted to watch and clock manufacture and to the manufacture of instruments, business machines and other items where finest work must be performed on fast production schedules. These machines have stood the test of time. 80% of present installations are repeat orders.

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BROWN & SHARPE NO. 2 SURFACE GRINDING MACHINE

The Brown & Sharpe Mfg. Co., Providence, R. I., announce their new No. 2 Surface Grinding Machine designed with improvements and selections of equipment to meet a wide variety of operating conditions.

The machine is available either with a 1½ hp driving motor in the base or with



a 1 hp motor driving the spindle directly (known as motorized spindle). When motor is mounted in the base, the drive to table and spindle is provided thru one endless belt concealed within the column, yet accessible and easily removed. Upon the motorized spindle type machine the drive from the motor to the spindle is thru a vibration-dampening coupling. The motorized spindle machine employs a ¼ hp motor in the base for table power feed.

Two rates of table travel are provided, 19 ft. or 31 ft. per minute. The change in rate is accomplished thru a clutch lever

at the front of the machine which permits an operator to change the table drive to suit the nature of the work.

A choice of a close fitting plain bearing spindle or a permanently sealed grease lubricated antifriction bearing spindle is available. Both are cartridge type, interchangeable, and have been designed to provide an exceptional grinding finish with quick spark out, the selection between types of spindle being dependent upon individual preferences and shop conditions.

The new machine is heavier, with a larger column for increased rigidity. A weighted idler pulley in the base of the machine maintains correct belt tension. Improved guarding is provided and conveniently placed controls assist in fast and accurate manipulation whether the machine is operated by power feeds or manually.

The electrical controls are housed in a separate compartment, sealed against entrance of foreign matter, yet easily accessible. The safety handle is interlocked with a disconnect switch. All electrical equipment is in accordance with Machine Tool Electrical Standards.

The machine is also available with hand feeds only (designated as No. 2B

Surface Grinding Machine) having the same spindle options as those described above for the No. 2 machine. Both Nos. 2 and 2B grind work to 18" long, 6" wide, and 9½" wide, using a wheel 7" in diameter.

For further information, write Brown & Sharpe Mfg. Co., Providence, R. I., Dept. BB.

PNEUMATIC HAND TOOL FOR SOLDERLESS WIRE TERMINALS

Designed for production line assembly, pneumatic-powered hand tool that installs solderless electrical terminals, has been announced by Aircraft-Marine Products Inc., 1581 N. Fourth St., Harrisburg, Penna. This tool is small enough to use in tight places and hard-to-reach jobs, and light enough to use without operator fatigue. Trigger - type control provides high installation speed, tool steel-crimping jaws, hardened for long wear, are interchangeable for various types of solderless terminals. Made for wire sizes from 22 to 14, each set of jaws accommodates a number of sizes. The exclusive toggle action employed provides 2000 lbs. crimping pressure from 85 lbs. air pressure.



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TAYLOR & FENN Spring Presses are used for Riveting, Staking, Stamping and similar operations on small, light parts. They are constructed to compensate for variation in thickness of the work and to deliver repeatedly a **UNIFORM BLOW**.

M-110 (illustrated) powered by a small reducer is designed to eliminate the fatigue factor inherent in foot operated Presses. A similar Press, M-120, of the same size and capacity is equipped to operate by compressed air.

OTHER MACHINES MANUFACTURED:

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Medium Duty and High Speed Sensitive Drilling
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& MACHINE CO. C E Sta., Bridgeport 5, Conn.

NEW KEYWAY BROACH KIT

The du Mont Corporation, Greenfield, Mass., announces the "Minute Man" Keyway Broach Kit for hand cutting of keyways of any standard width and any depth in gears, milling cutters or any parts that call for keyways.

Used with a hand operated arbor press,



the proper size bushing is selected from the kit and dropped into the bore. The broach of the desired width is inserted in a slot provided in the bushing and pressed thru with the arbor press, using shims and a second pass to get the exact keyway depth desired. Broaches, bushings, shims and keyway stock are all provided in the kit.

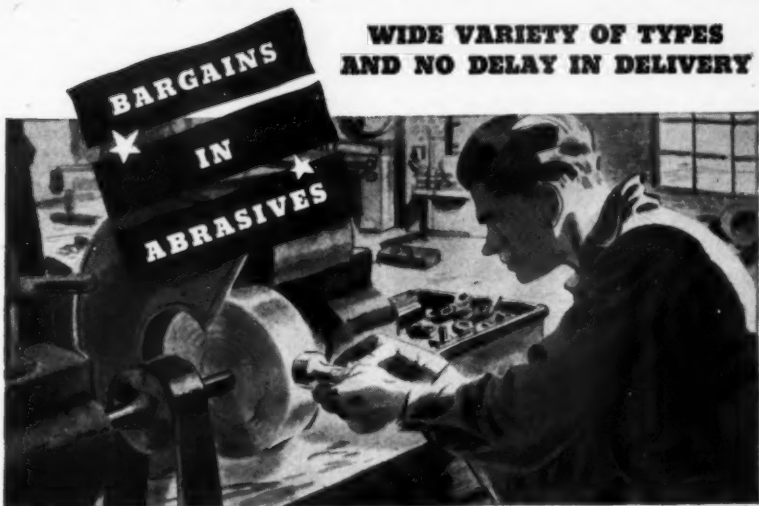
A catalog may be obtained by writing the Du Mont Corp., Dept. BB, Greenfield, Mass.

ELECTRONIC PYROMETRIC CONTROLLER

The new Veritron Electronic pyrometric controller has just been announced by the TACO WEST Corporation of 2620 South Park Avenue, Chicago. This instrument is a two position electronic controller offering many unique features.

In operation, the control pointer is set at the desired temperature and control is immediately established within an exceptionally narrow temperature range. The design permits the instrument movement to operate a heavy duty relay system without any physical contact or reaction effect on the indicating pointer. The relay is built in and has a load capacity of 3 KW Non-Inductive. The electronic circuit requires no tuning or other adjustments by the user at any time. This is accomplished without using high frequency oscillator systems, capacitance

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AND NO DELAY IN DELIVERY**



Grounding wheels—abrasive cloth—paper—belts—stones—sticks and hones—in all sizes and specifications may be had now from WAA surplus stocks. Bids are solicited for approximately \$1,000,000 worth of these abrasives. The offering includes both unused and used materials. Delivery can be immediate as priority claims have been satisfied. These abrasives may be inspected at any Regional Office holding the inventory.

Sales of abrasives will be held at frequent intervals. To receive information on future sales, write to the Regional Offices listed below asking that your name be placed on their mailing lists.

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systems or mechanical clamping mechanisms.

Measuring system and electronic mechanism are separately housed in sealed units that plug-in to the instrument case. The complete instrument measures only $7\frac{1}{8}$ " by $5\frac{3}{4}$ " by $5\frac{1}{4}$ ", and may be either flush or surface mounted. A full five inch mirrored combination scale is standard. Write for Bulletin PC-1.



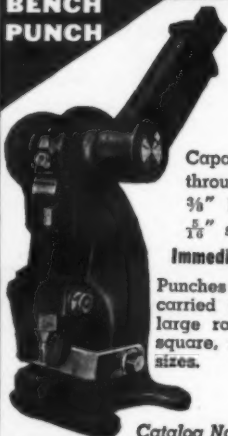
FALLS RELEASING TAP & DIE HOLDER

The new Falls Releasing Tap & Die Holder is designed for use in both screw machine and ordinary engine lathes. It is made in three shank sizes; No. 2 Morse Taper for use in engine lathe tailstock sockets; and in $\frac{3}{8}$ " and $\frac{1}{4}$ " straight shank for use in screw machine turret heads. All present sizes use the common 1" button type dies for external grinding or standard taps for tapping holes. Standard taps are held with one inch split bushings.

The economy of using this tool arises from the low initial cost of the holder and through the use of low cost standard button dies and taps. The manufacturer claims this results in approximately 1/5 the cost of conventional screw machine releasing tap and die holders with dies. Only one unit is required to function as either a tap holder or a die holder; a separate die holder and a separate tap holder is not required. Usually these standard button dies and taps are a part of every shop's set of hand threading tools so that no additional cost of taps and dies is required.

Operation of the unit is simple. Insert

FRONT LEVER BENCH PUNCH



**STURDY
•
DURABLE
•
HANDY**

Capacity: $\frac{1}{8}$ " hole through $\frac{1}{4}$ " steel or $\frac{3}{8}$ " hole through $\frac{5}{8}$ " steel.

Immediate shipment.

Punches and dies are carried in stock in a large range of round, square, flat, and oval sizes.

Catalog No. 8 available

T. H. LEWTHWAITE MACHINE CO.
311 East 47th St. New York 17, N. Y.

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the THICKNESS**



ARTUS Arbor Spacers made of plastic in various colors identify thickness at a glance! .001, .0015, .002, .003, .005, .0075, .010-.030. Speed up accurate fitting at low cost. Write for folder.

CONVENIENT TRIAL OFFER Handy Spacer Assortment

10 ea. .001 — .0125 thick
5 ea. .015 — .030 thick

100 SPACERS IN ALL

$\frac{7}{8}$ " — \$3.10 $1\frac{1}{4}$ " — \$3.80
1" — 3.35 $1\frac{1}{2}$ " — 4.70

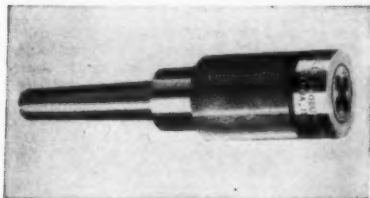
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INDUSTRIAL PRODUCTS SUPPLIERS

106 Water Street, New York 5, New York

a button die or tap with bushing in the front recess of holder housing, and secure with the Allen set screw. The entire unit is placed in the lathe turret head of tailstock, then the lathe stops are set for the proper depths of thread. The holder

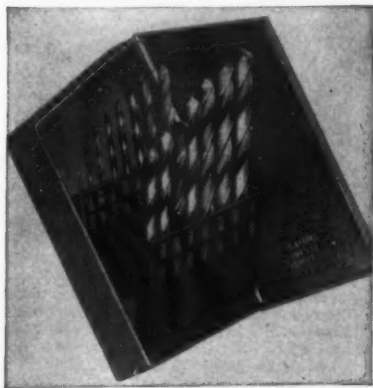


housing releases automatically at the conclusion of threading operation and backs off when rotation is reversed and tailstock or turret withdrawn.

Further information can be obtained from Falls Products, Inc., Dept. BB, Genoa, Illinois.

HUOT DRILL CASE

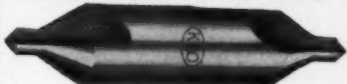
Huot Manufacturing Co., of St. Paul has announced the addition of a new drill case to their line of metal drill indexes. It has openings for drills from one-sixteenth to one-half inch with graduations



in thirty-seconds of an inch. It offers small shop owners in industry and home craftsmen a protective case for an assortment of fifteen drills. It is indexed in fractions of an inch as well as decimals.

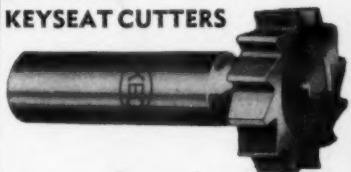


CENTER DRILLS



Made of finest high speed steel. Available in all standard sizes. Always in stock for immediate delivery. Specials made to your specifications.

KEYSEAT CUTTERS



High speed. Right hand. $\frac{1}{8}$ " shank. Diameters from $\frac{1}{8}$ " to $1\frac{1}{2}$ ". Standard sizes in stock for immediate delivery. Complete set 41 sizes—available in sturdy, hardwood box. Saves time and money, because you always have the size you need.

CENTER REAMERS



High speed steel. Reamers from $\frac{1}{8}$ " to 1" regularly furnished with 60°, 82° or 90° included angle. Specials made to your specifications.

LATHE MANDRELS



Precision made of tool steel, hardened and accurately ground. Tapered .0005" to the inch. Mandrels from $\frac{1}{8}$ " to 1" are .0005" undersize at small end, from $1\frac{1}{8}$ " to 3", .001" undersize. Immediate delivery.

Write for Literature

Illustrated literature and prices on all KEO Products mailed on request.

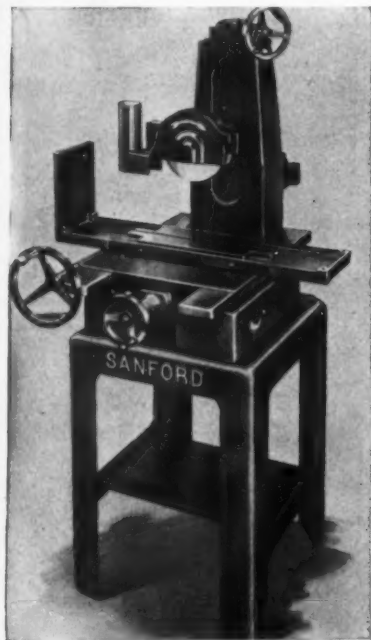
KEO CUTTERS

19326 Woodward - Detroit 3 Mich.

SANFORD SURFACE GRINDER

The Sanford Manufacturing Co. of Union, N. J., manufacturers of the Sanford High Speed Bench Surface Grinder announces a larger Hand Feed Surface Grinder, Model MG. It is comparable in accuracy and finish with the smaller Sanford Surface Grinder, and incorporates many of the features of the smaller machine, plus some new developments. It occupies limited space, 38"x45", and weighs approximately 400 pounds.

The grinding spindle is of hardened and ground alloy steel, mounted on pre-



cision ball bearings with take-up adjustment provided. Spindle assembly oil filters possible grinding dust, prolonging bearing life. An interchangeable standard wheel adapter is provided as part of the assembly. The wheel slide handwheel is graduated in .0005", the traverse handwheel in thousands (.001). The work table surface is 12½"x5", with a tee slot for ¾" standard tee bolts.

The MG Surface Grinder is anti-fric-

tional, lubricated for life; oilite bushings and needle bearings are used throughout. It features an 8" crossfeed, 13" longitudinal feed, and 12" vertical feed under a 7" wheel, and handles odd size toolroom and production jobs usually requiring larger and more expensive machines.

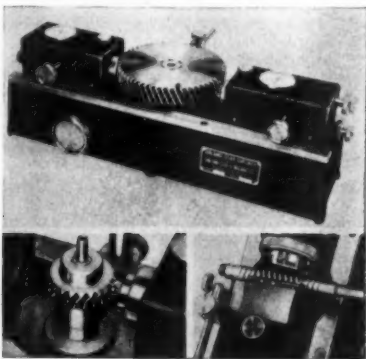
It is driven by a 1½ H.P., 115/230 Volt, single phase, 60 cycle, 3500 RPM motor, with a long life flat belt; also available are 220 volt, triple phase, 60 cycle, and 220/380 volt triple phase, 50 cycle motors.

The machine is suitable for either floor or bench mounting; for floor mounting, a cast stand is available. A wet grinding unit can be provided.

PRODUCTION GEAR CHECKER USES PINS AND BALLS

A new gear checking machine that makes possible rapid, accurate high production checking of spur and helical gears with pins and balls is announced by Orlandi Gear and Machine Company, 16195 Meyers Road, Detroit 27, Michigan.

Visual checking of pitch diameter, concentricity, size, tooth spacing, backlash and parallelism can be performed as fast



as an operator can lift one gear and replace it on the anvil or locating pin with another—several hundred pieces per hour.

Large and minute spur, helical and worm gears, plain and cluster, can be checked with high fidelity even by inexperienced help on the revolutionary Orlandi Checker according to Mr. A. S. Orlandi, president of the company.

The machine can be easily converted for rapid three wire checking of any thread form or for use as a comparator in checking precision parts.

PRECISION RADIUS DRESSER

A simplification in radius dresser setting, which cuts setup time required for grinding wheel dressing, is claimed to be provided by the new "Universal" precision radius dresser made by Universal Vise and Tool Co., Dept. BB, Parma, Mich. This radius dresser is set with gage blocks, inside micrometer, height gage or planer gage, allowing less skilled operators to achieve maximum machine accuracy. Radius precision is limited only by the accuracy of the setting device,

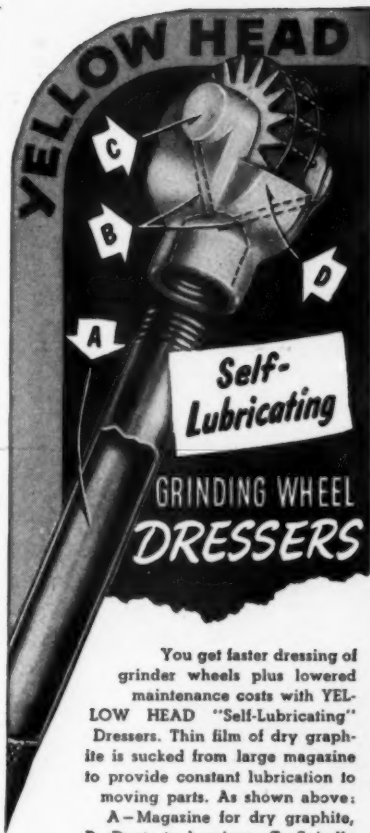


tolerances as small as .0001" being maintained.

This new dresser produces convex, concave and compound radii from 0 to 1" on wheels up to 1" diameter. It can be held either vertically or horizontally on a magnetic chuck. Frame and arbor of cast iron for utmost rigidity and lasting accuracy.

This "Universal" precision radius dresser is furnished complete with wooden case and two mounted diamonds. It is shipped from stock in Parma, Michigan. Complete details are given in a four-page illustrated folder, available on request.

Eli Whitney is credited with the origin of the theory of the interchangeability of parts. The story is told that he went to Washington with parts for ten muskets and requested the Secretary of War and some Army officers to assemble the muskets. Any part fitted any other part, and the muskets were assembled in a flash.



You get faster dressing of grinder wheels plus lowered maintenance costs with YELLOW HEAD "Self-Lubricating" Dressers. Thin film of dry graphite is sucked from large magazine to provide constant lubrication to moving parts. As shown above: A—Magazine for dry graphite, B—Ducts to bearings, C—Spindle bearings, D—Safety hood. There's also a plain type and selection of cutting heads available.

CITY MACHINE CO., DEPT. MT
PIQUA, OHIO



Write
for complete details and prices

SOSSNER'S

MIRROR-FINISH

for

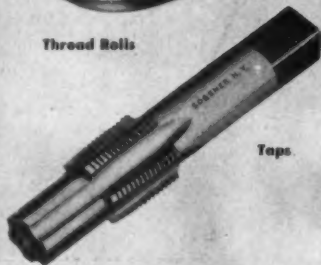
➔ greater wear resistance

➔ finer part finish

➔ greater production



Thread Rolls



Taps

Sossner's amazing long-life Mirror-Finish has been developed to give greater production of superior precision parts. It is included on ALL Sossner taps, standard or special, and thread rolls.

Taps • Plastic Molds • Hobs • Steel Stamps

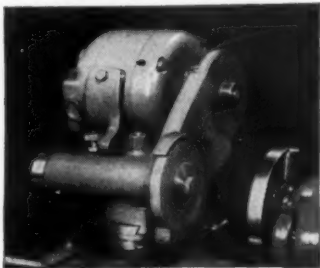
SOSSNER

161 GRAND STREET, NEW YORK 13
27 BROADWAY, LYNBROOK, N. Y.

LATHE GRINDING ATTACHMENT

An electric grinding attachment for lathes and other machine tools has been developed by the South Bend Lathe Works. Designed primarily for precision external grinding, it is equipped with a 4"x1/2" grinding wheel which is driven by a constant speed continuous duty 1/4 h.p. motor. This permits heavier sustained cuts than would be practical with a universal type motor of the same rated horse power. This grinding attachment can easily be adapted to other makes of lathes, milling machines, shapers, planers, etc. and is available with frame sizes to fit the various sizes of South Bend Lathes.

The grinding wheel spindle runs on pre-lubricated sealed precision ball bearings which require no adjustment or additional lubrication. Effectively protected from abrasive grinding wheel dust,



the sealed bearings will retain their precision indefinitely. Tension adjustment is provided for the V-belt which connects the motor with the grinding wheel spindle. Both the grinding wheel and the V-belt are enclosed in a single guard.

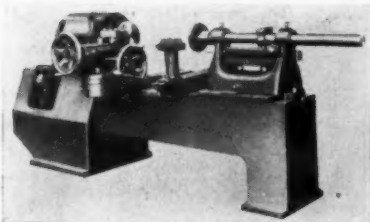
Spring stops for grinding straight and spiral fluted reamers and cutters, diamond dressers for truing the grinding wheel, and holding fixtures for the dressers, can be furnished for use with this grinding attachment. Grinding wheels are available in several grades for grinding various materials including tungsten carbide, tool steel, machine steel, cast iron, brass or bronze, aluminum, Bakelite, hard rubber, and soft rubber. Special cup wheels are supplied for reamer and cutter grinding.

For more complete information, catalog, and prices of this grinding attachment, write to the South Bend Lathe Works, 384 E. Madison St., South Bend 22, Ind., Dept. BB.

NEW BLISS SPINNING LATHE

With the announcement of its new second operation spinning lathes, the E. W. Bliss Company, Detroit 2, Michigan offers fast, light equipment to bulge, neck, bead, wire, flange, curl, and trim a variety of drawn or spun shells.

Not recommended as an alternative to



the toggle press for producing shells from flat discs, these lathes are primarily intended to supplement the latter machines by rapidly accomplishing secondary spinning operations on products previously drawn in presses, and at a rate commensurate with the primary operation.

By using welded steel construction for the frame it is now possible for the company to install a fully enclosed, V-belted motor drive and gear box, without any increase in weight above that of the bare machine as furnished in the old design.

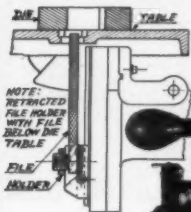
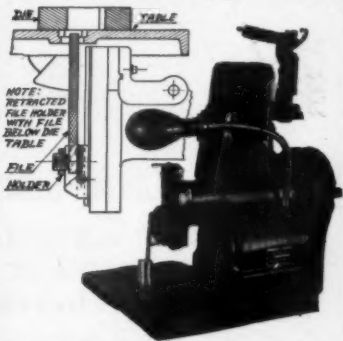
A combination multiple-disc friction clutch and brake insures instant stopping and starting, which, together with the fast acting tail-stock toggle clamp, permits rapid loading and unloading of the machine.

The tail-stock's offset adjustment allows use of inside form rolls to replace the more expensive and slower sectional chucks that are used for many necking operations.

The new lathes are offered in two sizes, with up to 30" swing and 92" bed-length. Headstock spindles run on Timken bearings at the following instantly variable speeds: Model number 15 at 275, 365, 615, and 1140 R.P.M.; Model number 16 at 180, 370, 675, and 1140 R.P.M. The lathes weigh 1500 and 3000 pounds respectively.

Lateral and longitudinal handwheel control of the compound rest provides maximum rigidity for the frictionless spinning and burnishing tools, and minimizes the manual dexterity necessary for consistent, long-run production. Other attachments include a wiring rest, operated by a tilting lever, that can be pivoted to approach the work from any desired angle.

World's Fastest DIE-MAKER and DIE-FINISHER NEW RETRACTABLE DUPLEX No. D-5 Punch & Die Filing Machine



NOTE:
RETRACTED
FILE HOLDER
WITH FILE
BELOW DIE
TABLE
FILE
HOLDER

- Only one second to retract file below die for inspection.
- Only one second to reposition file up thru the die for filing.

Anglemaster Ultra Precision Sine Vises



**NOTHING FASTER — for
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NO CLAMPS! NO STRAPS!**

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- Fast, accurate angular set-ups.

IDEAL TOOL AND DIE CO.

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SCHENECTADY 3, NEW YORK

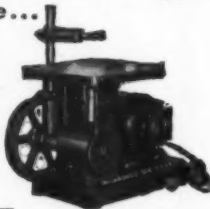


GRIND Curved Contours TO CLOSE TOLERANCES with THE MILWAUKEE PROFILE GRINDER

In tool-room, machine-shop or production grinding, this high-speed bench type machine does a slick job of grinding curved contours. It is especially valuable in precision finishing interior surfaces of hardened steel parts for tools, dies, jigs and fixtures. It supplements work of the...

MILWAUKEE DIE FILER

This machine is used primarily for filing straight lines and sharp corners in the softer metals, before heat treating.



You Need Both —

To handle a full range of tool, die and machine-shop work efficiently and accurately. Both are stocked and sold by Machinery and Mill Supply Dealers.

Milwaukee
CHAPLET & MANUFACTURING CO.

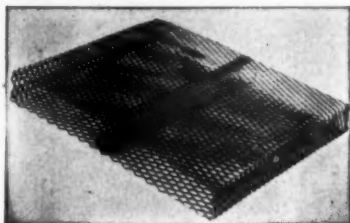
1027 S. 40th ST., MILWAUKEE 4, WIS.

EXPANDED METAL PALLET

A new Expanded Metal Loading Pallet, which combines light weight with serviceability, has been designed by Phillips Mine & Mill Supply Company, Pittsburgh, Penna.

The expanded metal process is said to provide a lightweight pallet with sufficient deck friction to effectively hold loads. The new pallet is constructed of 13 gauge material with $\frac{1}{2}$ " openings and will accommodate approximately 3000 lbs. of load, regardless of size.

This company has also added a new



Wood Deck Steel-Bound Phil-Pallet to their pallet line. Both of the new pallets are now available to industrial users.

For further information concerning the new Expanded Metal Pallet or the Wood Deck Steel-Bound Phil-Pallet, write Phillips Mine and Mill Supply Co., 228 Jane St., Pittsburgh 3, Pa.

GEORGE T. SCHMIDT MARKING TOOLS AND MACHINERY

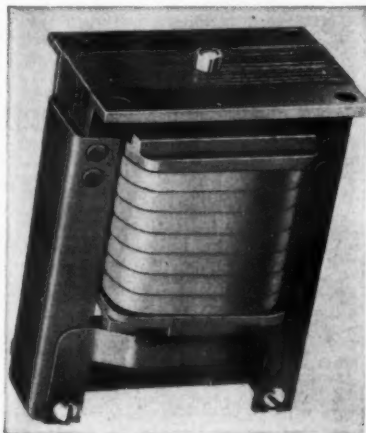
Their 52nd Anniversary Catalogue has just been announced by Geo. T. Schmidt, Inc., designers and manufacturers of Marking Tools and Marking Machinery. This 150-page, loose-leaf, bound book is graphically illustrated with over 800 pictures and diagrams describing a complete line of marking tools. It also contains a wealth of information having a direct bearing on marking problems and everyday operations, thus making this book a plant library item.

Producers of metal components, who are not now permanently marking their products or who find their current methods costly, will profit through study of this catalogue.

Address Dept. BB, Geo. T. Schmidt, Inc., 1802 W. Belle Plaine Ave., Chicago 13, Illinois.

PRACTICAL ELECTRIC RELEASES SOLENOID

A new type of solenoid, consisting of only five component parts is announced by the Practical Electric Co., 4505 Oakwood Blvd., Melvindale (Detroit), Mich. Its features include simplified construction, fan-proof laminations securely assembled by an electro-hydraulic forging



process, coils identified by a lead wire color code, a coil-locking device, and quiet operation at an extremely low coil current, obviating any harmful temperature rise. Back stops are provided to absorb operational impacts by the armature which would shock the solenoid structure.

D. C. MOTORS

Good delivery on 1/4, 1/3 & 1/2 H.P. direct current motors. Mfrs. of A.C. generators 500 watts to 125 K.W. Rotary converters, frequency changers, light plants.

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ARGUTO OILLESS BEARING CO.

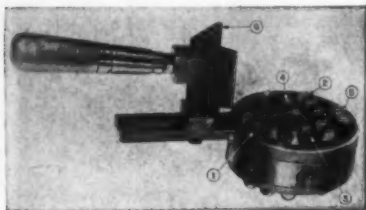
WAYNE, ILLINOIS

PHILADELPHIA

SAFETY AXLE MARKING TOOL

Here is a tool for marking of end faces of locomotive and railroad car axles. The marking is done after the rough turning operation. The new tool eliminates picking-up and laying down individual hand stamps for marking each letter or figure.

The new Axle Marker provides for a complete marking set-up at one time. Ordinary straight sided stamps can be used in sections marked (1) and (2), which usually are serial numbers or special heat numbers. Individual friction



springs hold stamps in place.

Sections (3), (4) and (5) are for the month, year and company symbol respectively. A special adjustable "V" gauge (6) is provided for positioning the marking properly on axles of different sizes.

Each stamp must be struck individually but since all stamps are in position for use, the total time involved for the complete marking is reduced 25% to 50%.

Complete information on this new Axle Marker and other special Safety Marking Tools can be furnished by writing to M. E. Cunningham Co., 228 Carson St., Pittsburgh 19, Pa.

ARC WELDING COMPOUND

POM is a new, improved arc welding compound developed to produce cleaner, better welds. It is an electrically conductive composition of inorganic minerals which supplement the fluxing action of the welding rod coating. It stabilizes and quiets the welding arc, prevents arc breakage, improves fusion and prevents scale on both sides of the weld bead. POM also prevents adhesion of weld spatter to parts being welded . . . thereby eliminating spatter-cleaning operations.

POM contains no oils or other combustible ingredients and therefore causes NO smoke, fumes, or odors under the heat of the welding arc. POM is a paste which is thinned by the user with an equal part of water and is brushed or sprayed into the seam to be welded and on adjacent surfaces where spatter usually collects. After welding, all spatter and compound are quickly wiped off with a dry cloth leaving a spotless weldment ready for painting. POM contains a rust inhibitor so that it can be applied to the steel at any time before welding and will protect the parts from rust until they are fabricated. POM is packaged in 1-gallon and 5-gallon pails. Manufactured by G. W. Smith & Sons, Inc., Dept. BB, 5400 Kemp Road, Dayton 3, Ohio.

RUBBER-TIRED CASTER

A new aluminum alloy rubber-tired caster in both rigid and swivel types is announced by the Aerol Company, 1823 E. Washington Boulevard, Los Angeles, manufacturer of materials handling equipment. The company also manufactures a complete line of rubber-tired in-



USE SCHMARJE
CARBIDE-TIPPED
HIGH PRODUCTION TOOLS

SCHMARJE TOOL AND ENGINEERING CO.
MUSCATINE, IOWA

ARMOR MILLS GIVE MORE

- WEIGHT
- SIZE
- USE
- ACCURACY

**THAN OTHERS
TWICE ITS
PRICE!**



CHECK THESE SPECIFICATION COMPARISONS

	ARMOR MILL	1st Competitor*	2nd Competitor*
TRAVEL	12" Long 10" Vert. 7" Cross	10" Long 6" Vert. 3 1/2" Cross	12 1/2" Long 8 1/2" Vert. 5 1/2" Cross
DUAL BELTS	YES	NO	NO
SEMI-STEEL PULLEYS	YES	NO	YES
SPINDLE SPEEDS	8	8	4
HORIZONTAL SPINDLE	YES	YES	YES
VERTICAL SPINDLE	YES	NO	YES
POWER FEED	YES	YES	NO
HORSE-POWER	1 h.p.	1/3 h.p.	1/3 h.p.
GROUND LEAD SCREWS	YES	NO	NO
HAND SCRAPED WAYS	YES	NO	NO
WEIGHT	320 lbs.	191 lbs.	215 lbs.
PRICE **	\$295.00	\$286.00	\$280.00

* Names of competitors' machines furnished on request.

** Base Price. Accessories extra.

AIRCRAFT MACHINERY CORP.

BURBANK, CALIF.

dustrial wheels as well as special all-aluminum wheels for use in ovens and other high temperature applications.

Carefully designed and engineered to give maximum performance with clean, streamlined appearance, the new Aerol caster embodies such features as heavy duty shake-proof king pin, labyrinth dirt seal to protect lubricated bearings, extra offset for instant trailing. Light, strong aluminum alloy increases efficiency by cutting down dead weight without sacrificing strength requirements. Smooth surfaces shed dust and dirt. Precision construction of the wheel assembly and the use of Timken Tapered Roller Bearings on the race assure straight, even tracking and sensitive swivel action even under heavy loads.

Both thrust and king pin bearings are factory-greased Timken Tapered Roller Bearings that eliminate all axle wear and side-play. Aluminum grease retainer ring seals grease in, and keeps foreign particles out, eliminates the necessity for lubrication under normal conditions.

Aerol casters come with tough, all purpose solid rubber tires that resist oil and water and are guaranteed not to separate from the wheel core. They are available in a complete range of sizes in either swivel or rigid types.

MICRO MINIATURE END MILLS

The Woodson Tool Co., Inc., 4811 1/2 W. Lennox Blvd., Inglewood, Calif. announce the development of the Micro Miniature End Mills. These tools were originally produced to meet a specific problem, the need for a small metal cutting tool that would produce accurate results on difficult production runs, as well as in the tool room.

Engineers have found that manufactured parts and tool work requiring small end mill operations, such as milling, engraving, routing, and profiling, can be done with the use of Micro Miniatures. These operations within the size range of Micro Miniatures were considered impractical in the past, and were avoided, because no such small metal cutting tool with sufficient productive ability was available.

The manufacturers of these miniature end mills claim that they have unusual strength, sharpness, and durability. All grinding operations are performed after the steel has been properly heat-treated. The radial clearance is curved, and the grinding lines are parallel to the cutting edges. The Woodson Tool Co. claims that the use of these mills will reduce small end mill breakage, and save "down time" on machines.

SIMONDS HACK SAW BLADE TESTER

A Simometer, which measures applied tension of power hack saw blades and indicates the correct amount for maximum cutting efficiency has been announced by the Simonds Saw and Steel Co., Fitchburg, Mass.

The Simometer is attached to the blade to be tested by means of two thumb screws. As tension is applied, a pointer on a dial indicates the correct tension, after which the device can be removed and the blade put to work. The Simometer avoids inaccuracies due to blade holder friction or variations in the pitch of threads in tightening devices.

Developed in the research laboratories of Simonds Saw and Steel Company, the device is said to lengthen blade life as much as 15%. The Simometer is distributed thru leading industrial supply houses. Information concerning the loca-



tion of the supply house most convenient may be obtained by writing to Dept. BB, Simonds Saw and Steel Co., 470 Main St., Fitchburg, Mass.

HEAVY DUTY INDEXING TABLE

Designed and built to support heavy workpieces without deflection, the Model 700 Indexing Table, manufactured by the Kaukauna Machine Corporation, Kaukauna, Wisconsin for use with their series 125 Portable Horizontal Drilling and Tapping Machines, is today being adapted for use with many other types of machine tools. It is also ideally suited for inspection or layout work because of its unusual flexibility and rigidity.

The main bed is of heavy well-ribbed cast iron construction, with T-slots provided in the top and at each end for clamping purposes. Thus work can be held in either the horizontal or vertical plane. It is also possible to make a set-up on one end of the table while work is being completed at the other end, which saves valuable machine operating time. A 36" diameter indexing platen, also of



DOWEL PINS



Immediate Delivery!

Standard Size Dowel Pins from $\frac{1}{8}$ " to 1" diameter and from $\frac{3}{8}$ " to 6" length supplied in .0002 and .001 over basic sizes. Unless otherwise specified, .0002 oversize will be furnished.

SCHULTZ & ANDERSON CO.

109 Edison Place, Newark 5, N. J.



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1422 E. 109th St., Dept. H, Cleveland, Ohio

heavy well-ribbed cast iron construction, manually operated and which can be locked in any position, is in the center of the main bed, supported by an extra capacity ball thrust bearing. A hardened steel plunger and hardened steel bushings assure positive indexing positions. T-slots in the platen are provided for workpiece clamping, and two easily adjusted shoes clamp the platen firmly in position. The overall dimensions of the Kaukauna Model 700 Indexing Table are 72" long



by 36 1/4" wide, and standing at a height of 29".

Further details on this very practical indexing table can be secured from the manufacturer, Dept. BB.

CHEMICAL PUBLISHING CATALOG

The Chemical Publishing Co., Inc. has published a new Catalog of Books on chemistry, technology, engineering and related subjects published in the last six years. Opportunity is also taken of introducing the new Remsen Press to help readers keep pace with the latest developments in science. The Catalog lists books now in preparation by the Remsen Press for the convenience of those who wish to order. The catalog may be ordered from Dept. BB, Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y.



ABRASIVE CENT-R-LAP TOOL

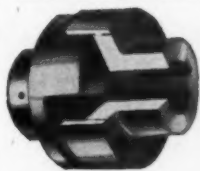
Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes 3/8" and 1/2" Cent-R-Laps and abrasive Cones.

Write for descriptive literature and prices.

J. R. Reich Manufacturing Co.
45 E. Stroop Rd. Dayton 9, Ohio

For Flexibility in Power Transmission— LOVEJOY L-R Flexible Couplings

LOVEJOY L-R Type "H", 4.60 to 806 h.p. shown, for heavy duty. Electric steel castings. Free floating load cushions. Best correction of transmission troubles. Quiet. Send for free Selector charts and Catalog. Couplings from 1/6



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LOVEJOY FLEXIBLE COUPLING CO.

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EQUIPMENT**
must have
**PRECISION
GEARS**



**Abart
GEARS**

Abart, long supplier of gears for electrical industry, knows the particular gear requirements. Every Abart gear is made to fit the conditions of use as to design, material, cutting and finish. Spur, bevel, worm, worm wheels, spirals, internal—all to your specifications.

Prompt delivery.
Send B/P for
quotation.

Abart GEAR & MACHINE CO.

4832 W. 16TH ST.

CHICAGO, ILL.

SQUARENESS-OF-FACE GAGE

Bryant Chucking Grinder Co., Springfield, Vermont, announces a new gage for checking the important relationships between the pitch diameter of a thread and the face of the part. This new Squareness-of-Face Gage may be mounted on any Bryant Thread Gage. The face gage consists of a movable arm which carries

turn more checks the right angularity which is recorded visually on the other dial indicator. The control lever is then actuated, allowing the part to be lifted from the gage, thus eliminating unscrewing the part off the thread segments. No "feel" is necessary for inspecting the threads or their squareness to the face; thus unskilled operators can run the



a large dial indicator and two contact points which are adjustable to cover the capacity of the thread gage. The inner contact serves as a pilot and compensates for thread progression as the part is turned for inspection. The front contact actuates the dial indicator on the face gage.

Operation of the gage is as follows: the control lever withdraws the thread segments behind guides, the part is positioned and the three thread segments are engaged (left photo); the part is given one-third of a turn for all-over thread inspection, which is recorded visually on the thread gage dial indicator. The squareness-of-face gage is then swung into position (right photo) and a half



Bryant gage at high speed and with complete accuracy.

Each Squareness-of-Face Gage is furnished with a master setting ring with one face ground square.

Various models cover capacities from $\frac{3}{8}$ " to 8" internal thread diameter.

Some of the blame for retardation of colonial mechanical efforts may be laid at the doorstep of King George III. He forbade deportation of machine plans and specifications to America. Sorely needed mechanics came to America with the first wave of immigrants in 1790.

G-E TELEMETERING CONTROL SYSTEM

A new 15-pound telemetering system, developed by General Electric and designed to track rockets speeding at approximately 3800-mph, was successfully tested in the V-2 missile firing at the Army Ordnance Proving Ground, White Sands, N. M., on January 23. Measurements of acceleration, position of control vanes, and fuel pressure as well as scientific data on rocket skin temperature and other facts were received at the ground station and permanently recorded on film.

The G-E system uses only 10 electronic



tubes as compared to the 30 tubes in a similar system. Enclosed in the rocket war-head, the new missile-borne unit is packaged in two pressurized cans, each 4 inches in diameter and 12 and 15 inches long. Power is supplied by a separate 28-volt battery, located in the control compartment, which weighs 12 pounds.

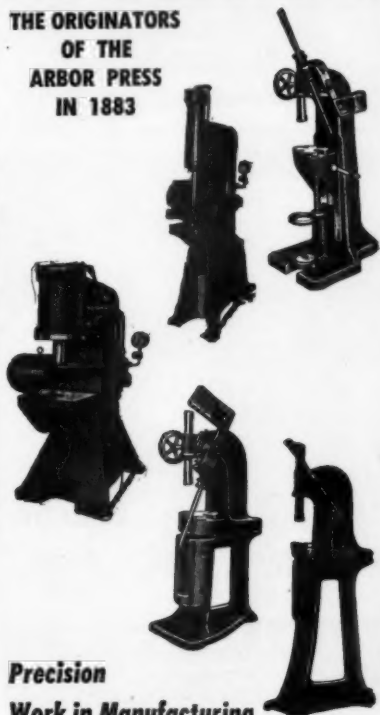
Since the system is mechanically commutated, each of a number of quantities of interest must be converted to a voltage that varies between zero and plus five volts and must be connected to one segment of a stationary commutator. Twenty-eight such channels are provided and

FOR ASSEMBLY, BENDING

★ AND BROACHING ★

1883 - GREENERD - 1946

THE ORIGINATORS
OF THE
ARBOR PRESS
IN 1883



Precision

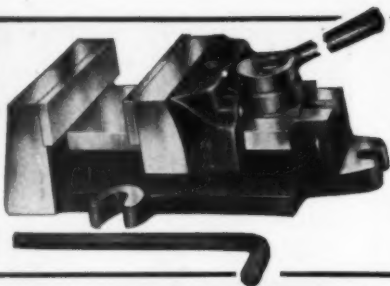
Work in Manufacturing

An Arbor Press for every need, ranging from $\frac{1}{4}$ to 30 tons capacity, both hydraulic and mechanical types. Write for Catalog G.

GREENERD ARBOR PRESSES

NASHUA, NEW HAMPSHIRE, U.S.A.

EST. 1883



PLUNKET QUICK ACTION VISE for DRILL PRESS or MILLING MACHINE

Designed for production work, using an eccentric motion to apply pressure to jaws.

Eccentric motion moves jaw 5/16".

Size 6" jaws, 1 1/2" deep, opens 4".....**Net Price \$46.20**

Pressure between jaws, with handle furnished, 2200 lbs. Net weight 36 lbs. Our complete line includes Vises for Drill Presses, Milling Machines, Shapers, Grinders

WRITE FOR CATALOG

J. E. Plunket Machine Co. 1823 W. Lake St.
Chicago 12, Ill.

Standard Since 1911



INCLINABLE POWER PRESSES

**5 to 79 tons
NO. 5 BACK
GEARED TYPE**

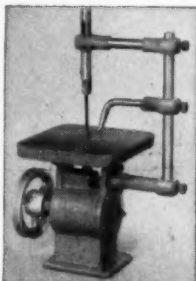
Write for
catalog.

L & J PRESS CORP.

INCORPORATED IN Litchfield, Indiana Tool & Machine Co.
1625 STERLING AVE ELKHART, INDIANA

Die Filer and Saw

**A versatile tool for every
tool room or machine shop**

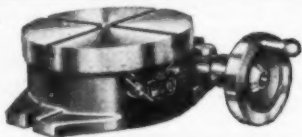


File is fixed in its up and down stroke, assuring precision filing. A adjustable table, can be locked for precision angles. Overall arm removable for small internal filing. Use as jig saw . . . sawing plugs for die punches . . . general contour work.

Bench Model \$67.50
F. O. B. St. Paul

MASTER PRODUCTS INDUSTRIES

79 W. Summit Ave., St. Paul 2, Minn.



Troyke Rotary Tables
9" to 25"



Carroll Dividing Heads
6" to 12"

TROYKE MFG. CO., 4422 Appleton St., Cincinnati 9, Ohio

a rotating brush samples each of these 35 times per second. These samples of voltage are converted to pulse-width-modulation; i.e., a zero voltage input to one channel is converted to a 50 micro-second pulse, while a five-volt input is converted to a 650 microsecond pulse. A five-watt transmitter sends this signal to the ground.

At the receiving station a linear sweep on one cathode-ray oscilloscope is triggered by the leading edge of each received pulse. The incoming signal is put on the intensity grid so a line, whose length is proportional to the quantity being measured, will appear on the scope. The film records while moving steadily in a vertical direction. All the samples on all the channels will appear as parallel lines of varying length. Thus, one rotation of the commutator, or one sample of each channel, is represented by a block of 28 parallel lines. The over-all error, counting all the transformations from the original quantity to the final record, is only about 2 to 3 per cent.

CERWECO STEEL HAND BRAKES

The Wm. C. Johnson & Sons Machinery Co., St. Louis, Mo., fifty years in the machine tool sales business, have announced a new line of all steel standard apron type hand bending brakes. This new brake is to be distributed by the various local machinery dealers thruout the country under the trade name of Cerweco. Primarily they are being built in four sizes most in demand: 4' 12 ga., 6', 8' 14 ga., and 10' 16 ga. Other sizes will be added as production permits, including a line of box and pan brakes. These new brakes are well engineered and simple to set up and operate. They are built under contract by the Certified Welding & Engineering Co. of St. Louis, who are experienced in fabricating and welding steel. Requests for circulars and quotations will receive prompt attention.

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 6 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

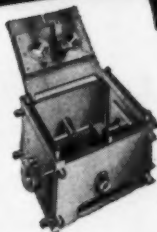
NEW Drillet JIG BOX

CUTS DRILL JIG COSTS 75%

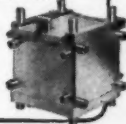
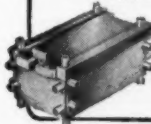
DOES AWAY WITH SPECIAL TOOL DESIGN OF THE JIG BODY



Casting Machined by using standard Drillet Jig Box



BUILT IN STANDARD SIZES AND SHAPES UP TO 6" x 6" x 6" PATENTS APPLIED FOR



The Drillet Jig Box is a six sided leaf type jig for all phases of drill press operation. Tooling expense can be reduced as much as 75%. All that is necessary is for toolmaker to locate part and insert drill bushings. Eliminates preliminary steps required in building and squaring jig. Side plates, end plates and leaves are replaceable for immediate delivery. Before investing hundreds of dollars in your toolmaker's time—Write for Literature and Prices.

Full Scale Tracing Templates with Orders on Request.

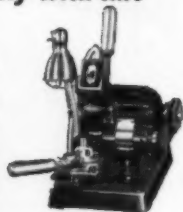
CHICAGO

DRILLET CORPORATION

1735 N. Winchester Ave., Chicago 22, Ill.

MILL SMALL PARTS...Fast— Accurately with this

NEW
Rouse
**HAND
MILLER**



\$98 (Without Fixtures)
F.O.B. Chicago, Motor Extra

Rouse
Fixture Set-Ups
that Speed Pro-
duction.



It's a high-speed, motor-driven unit that has many uses in finishing operations for light cuts on aluminum, brass, steel and other metals... also, rounding and burring steel and cast iron. Inexperienced operators quickly learn to use it with speed and precision.

The Rouse Hand Miller, with Rouse Fixture Set-Ups, provides fast, accurate, low-cost milling for a big variety of small parts used in electrical work, instru-

ments, aviation, communications and similar work.

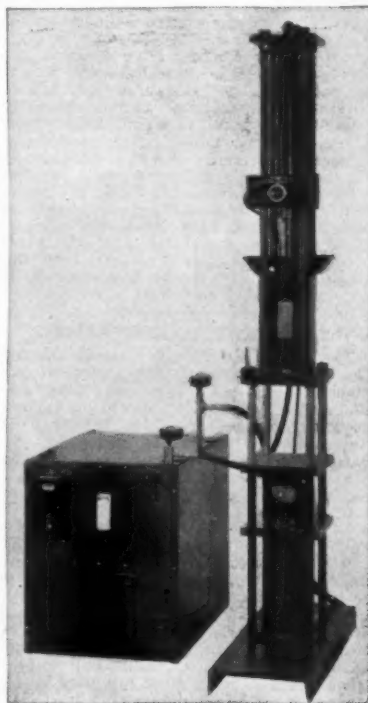
Available for immediate shipment. Write for illustrated circular and full details.

**H. B. ROUSE
AND COMPANY**

2216 N. Wayne Ave. Chicago 14, Ill.

HYDRAULIC INJECTION MOLDING PRESS

A motorized hydraulic injection molding press, is announced by the Munton Manufacturing Company 9400 Belmont Avenue, Dept. BB, Franklin Park, Ill.

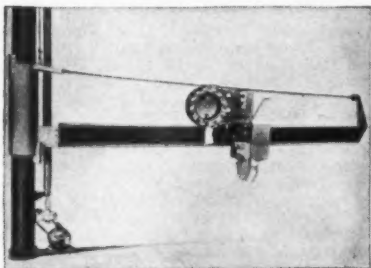


Three ounce capacity-mold sealing or clamping pressure 50,000 pounds. Injection pressure 12,000 pounds per sq. inch. Heating cycle $2\frac{1}{2}$ ounces per minute without pre-heating; operating cycle 30 seconds, maximum opening for molds 12 inches.

All operations are performed with levers and treadles. All hydraulic using Munton rams and motorized units which are proven products in the hydraulic field.

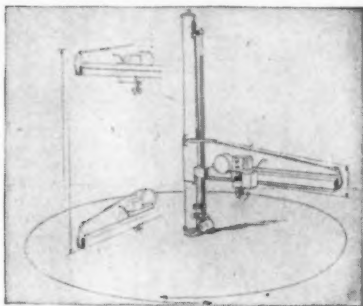
ARC POSITIONER FOR AUTOMATIC WELDING

A service providing greater mobility and a decreasing time-loss factor for users of the latest automatic process of



shielded metallic arc welding was announced by Mark F. Gouran, Welding Engineer, 7426 Devon St., Mt. Airy, Philadelphia, Penna.

The "Arc Positioner" is comprised of an automatic shielded arc welding head, traveling on a beam that encompasses a vertical zone of eight feet, with the assembly rotating around a fixed axis to a maximum radius of 20 feet. It is a facility



that augments the proved efficiency of automatic arc welding; it is manufactured in three sizes, providing a 10, 15, and 20-foot horizontal arc travel.

The head travels on the beam to lengths, as stated above, of 10, 15, and 20 feet, while the vertical operation of the head,

When it comes to Ring or Plug Gages better check with **NILSSON**

- RINGS and PLUGS with service life and accuracy insured by lapped, mirror-like finish on all gaging dimensions — by holding to tolerance on the "wear surface."
- DELIVERY WITHIN 10 DAYS after receipt of your order — within 24 HOURS on plugs in limited quantities.



Renewal Service for Worn Rings and Plugs

Rings and Plugs worn beyond tolerance size can be restored good as new! How so? By Chrome Plating! Nilsson increases service life from 4 to 6 times over ordinary hardened tool steel gages. The reason? When Nilsson applies Chrome, approximately .0015 to .002 is left on to the finished size! This lessens cracking, breaking, minimizes wear. Last, Nilsson lapping know-how gives high lustre—longer wearing quality.

Write for Catalog for details on new Nilsson Ring and Plug Gages — and for prices on Renewal Service.



REG. U.S. PAT. OFF.

NILSSON GAGE CO., INC.

Poughkeepsie, N. Y.

which is powered by a motor-driven adjustment on the beam, covers an operating zone from the floor upwards to a height of eight feet. The vertical adjustment of the beam is accomplished at a rate of 36" per minute and permits inching the beam up or down to obtain the exact height. The beam, in its horizontal applications, may be swung manually 360 degrees varying in radii according to the length of the beam.

CHICAGO PRECISION ELECTRIC DRILL

A new portable electric drill Model 63 is announced by the Chicago Precision Machine Co., 920 So. Michigan Ave., Chicago 5, Ill.

According to the manufacturer, the light weight (3¾ pounds) balanced construction of this new tool reduces operator fatigue, and simplifies ease of handling; it is suitable for general use on production, maintenance, and repair jobs.

The tool drills up to ¼" in steel, and up to ½" in wood. Model 63, which is equipped with a three-jaw Jacobs chuck, with key, operates on 110 volts, ac-dc current with a finger-point switch. It is furnished with twelve feet of rubber

cable, and attains a free speed of 2000 rpm.

STRAIGHT OIL GAGES

The OIL-RITE Corp. announces a line of newly developed Straight Oil Gages, a companion to OIL-RITE'S Elbow Oil Gages. They combine unlimited visibility and unbreakable plastic sights. The gage body is machined from hexagonal bar stock, and a heavy central stem with top cap to support the unbreakable plastic sights provides a rugged unit. An independent nut locks the unit together compressing the gaskets thus eliminating any chance of leakage.

The gages can be taken apart for cleaning by removing the top nut. Full vision is assured by the absence of a protective cover usually used for glass sight gages. The use of plastic sights eliminates the hazards of broken glass and cost of replacements.

Standard sizes cover a gage range of 2½" to 5" and sight diameters of ½"-¾" and ½" N.P.T. Gages with special features can be furnished. Complete details for all applications will be furnished by the OIL-RITE CORPORATION, Dept. BB, 3474 S. 13th St., Milwaukee 7, Wisconsin.



T E S A

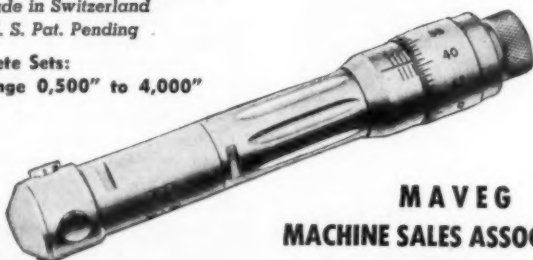
INTERNAL MICROMETER

Made in Switzerland

U. S. Pat. Pending

3 Complete Sets:

Range 0,500" to 4,000"



IMICRO

MAVEG

**MACHINE SALES ASSOCIATION
INC.**

24-16 Bridge Plaza South
Long Island City 1, N. Y.

Phone: Stillwell 4-8121

SECO HYPOT AUXILIARY

The SECO Hypot Auxiliary has been designed to operate as an intermediary between a 35 KV oil tester and a 115 volt single phase source. Convenient connection is provided by an input cord-plug and output receptacle. All components are housed in a durable, portable metal cabinet. The basic element is a POWER-STAT variable transformer driven by a synchronous, fast starting and stopping motor. Various switching arrangements enable the SECO Hypot Auxiliary to be completely-automatic or semi-automatic.

With completely-automatic operation,



the voltage at the output terminals increases uniformly to maximum by pushing the "START" button. A "STOP" button permits the operation to be stopped at any time; the output terminals to be de-energized; and the variable element of the POWERSTAT to be returned to the zero position.

With semi-automatic operation, voltage is increased or decreased in steps at a uniform rate by employing the "Raise-Lower" switch. Voltage can be set to the exact value by finger-tip control.

Colored signal lights provide effective means of determining the operations of the unit.

The specifications of SECO Hypot Auxiliary type S-803 pictured are:

Input: 115 volts, single phase, 60 cycles

Output: 0-115 volts, 2.0 KVA

Travel time: 11.5 seconds, voltage in-

Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R.P.M.

\$33²⁵

IN U.S.A.



Weight 12 ounces;
length 6¾ inches;
chuck size ⅜ inch.
Wheel guard re-
moved for better
illustration.

MADISON-KIPP CORP.

207 Waubesa St., Madison, Wis., U.S.A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

GAGES 50% OFF

All sizes thread plugs, thread rings, pipe plugs and rings, roll thread snaps—our \$100,000 stock of new VARD gages to be sold now. Many specials included at price of standards. Send us your orders today. We guarantee.

PAUL B. SLATER CO.
2335 E. 8th St. Los Angeles 21

crement 3 KV per second when used with a 35 KV hypot test set.

Detailed information may be obtained by writing The Superior Electric Company, 344 Church Street, Bristol, Conn.

MOTORIZED COIL FEEDER

A new motorized coil feeding device for feeding strip steel to power presses has been announced by The John Humm Safety Equipment Company. This company reports that their machine has many advantages over the conventional type of apparatus.

Among the special features incorporated in the design are pointed out by the manufacturer as follows:

- 1—The machine is motorized.
- 2—Loading is done easily.
- 3—Coils up to 12" wide may be taken.
- 4—No tools or wrenches are required.
- 5—The maximum capacity is 500 pounds.
- 6—Will start automatically when slack is taken up by machine.
- 7—Will stop automatically when slack is increased.
- 8—The machine is portable and may be plugged into any light circuit.

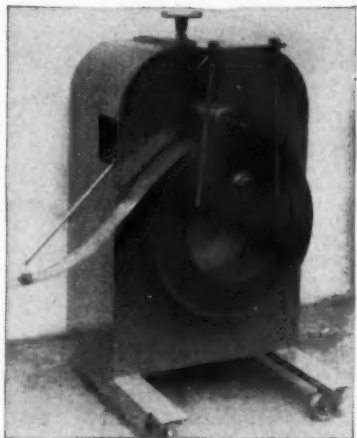
For further information on this or any other products by these manufacturers

PYRO THE SIMPLIFIED OPTICAL PYROMETER



Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.



write to John Humm Safety Equipment Co., Dept. BB, 253 Sheffield Ave., Brooklyn 7, N. Y.

TOP QUALITY CARBIDE

Send in specifications for free estimate on carbide use. Catalog sent on request.

ADAMAS

CARBIDE CORPORATION

Plant: 40-30 23 Street, Long Island City 1, New York
Telephone: STillwell 4-2959

Producers of CEMENTED CARBIDES in all forms

- Immediate Delivery
- Lowest Competitive Prices
- Proven Performance

SHEFFIELD SEGREGATING INSTRUMENT

A new and improved automatic segregating instrument for the rapid and accurate inspection of compression and



oil piston rings has been designed and built by the Sheffield Corporation, Dayton, Ohio. It will automatically check thickness to a tolerance limit of .0005" and gap width to a tolerance of .007" or .010", and segregate rings at a rate of 2,400 per hour.

After the instrument has been set up, using piston rings of known minimum and maximum dimensions as masters, the operator places the rings to be inspected in the three-finger stack holder with the gaps arranged so that they fit the rail on the back finger. This insures all rings passing through the various gaging stations in the same manner and by pressing the start button they are automatically fed into the proper position.

The first gaging station compresses and checks the ring for undersize, oversize and within tolerance width gaps. If the dimension is out of tolerance, the ring is automatically rejected, removed from the gaging slide and placed in a special compartment. When the gap is correct, the ring proceeds to the next station where it is checked for thickness. Should it be either oversize or undersize, the Electriccheck gaging head operates mechanisms which automatically open trap doors and ring passes into either the

Anderson BALANCING WAYS

Shops handling rotating parts find this simple, sturdy and thoroughly dependable device highly efficient for balancing and truing operations. It assures better work ... saves time ... saves labor. No leveling required.

Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate indication of whether or not the work is in perfect balance.

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



See Our Catalog in Sweet's



Write for Bulletin 4-5

ANDERSON BROS. MFG. CO., ROCKFORD, ILL.

Cost Cutting Shop Tools

undersize or oversize compartment.

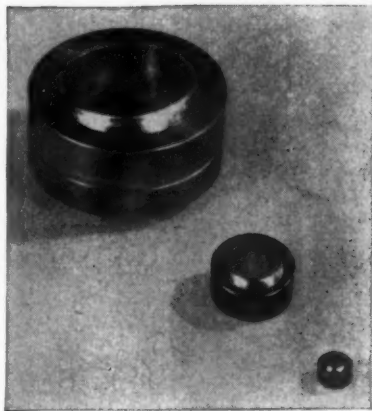
If all dimensions are within tolerance limits, the piston ring proceeds through all the gaging stations and down a chute into a receptacle for accepted units. The parts that have been rejected because of undersize gaps and oversize on thickness can be salvaged and reworked.

TWO-PIECE BEARING ASSEMBLY

Monoball two-piece bearing assemblies are now available in larger quantities to manufacturers of equipment using misalignment bearings or rod ends with misalignment bearings installed, according to Southwest Products Company, Dept. BB, 10 So. Catalina Ave., Pasadena, Calif.

Various applications for the bearings are installations with oscillating rods and tubes of low rpm; where lubrication by oil or grease is not possible, or wherever alignment is expensive to attain or where rigidity is desired.

The ball, which is hard chrome plated, is completely enclosed by the one-piece race. Race materials are bronze, steel or stainless steel. Bore sizes range from 3/16" to 3" and accommodate ultimate loads



from 7,000 to 500,000 lbs. Because of their compact size, lightweight and ease of installation, Monoball misalignment bearings have been widely used in aircraft and are standard equipment on well known makes of planes.



Spiral Flute COUNTERSINKS

Aero Spiral flute Co-sinks end chatter, cut clean and accurately. Stocked in 60, 72, 82, 90, 100, 120 degree included angle, 1/4", 3/8", 1/2", 3/4" diameter, with 1/4" shank and 3/8", and 1" dia. with 1/2" shank. Available from your Mill Supply dealer or direct.

AERO TOOL COMPANY
229 WEST OLIVE • BURBANK, CALIF.



MICROMETER STOP COUNTERSINK

Instant .001" adjustment #1900 Micrometer Stop limits depth of Co-sinks and Co-bores. Assures flushness. 1/2" Shank for drill press or hand drill. Cuts metals or plastics. Micrometer Stop \$7.25; HSS Cutters—7/16" dia. \$1.75, 3/8" dia. \$2.35. Specify Incl. angle and pilot. Folder free.

AERO TOOL COMPANY
229 WEST OLIVE • BURBANK, CALIFORNIA

WHITNEY-JENSEN PRODUCTS 30 YEARS EXPERIENCE

No. 20 BALL BEARING PUNCH



CAPACITY — 1/2" THRU 1/2"

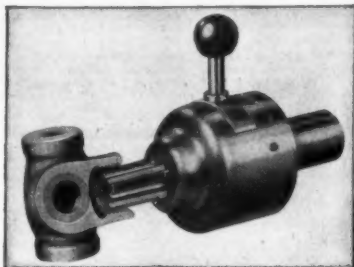
WEIGHT — 18 LBS.

Write for Catalog 16-45

WHITNEY METAL TOOL COMPANY
115 FORBES ST. • ROCKFORD, ILL.

COLLAPSIBLE TAP

K-W Products has announced that their new collapsible tap is now in production for the market, selling under the trade name "The Simplex Collapsible Tap."



Of interest to manufacturers and others engaged in production threading, the Simplex Tap is stocked in three sizes with standard chasers, covering a range of pipe thread sizes from $\frac{1}{2}$ " to 1", and of straight thread sizes from $\frac{11}{16}$ " to $1\frac{1}{16}$ ". Also made to order in tap sizes from $\frac{15}{32}$ " to 3".

Outstanding feature of the tap is that the chasers collapse automatically upon reaching desired depth of cut. This permits immediate withdrawal of the tap without reversing, eliminating fins and score marks and producing accurate threads. The manufacturer states that more than 50% in tapping time is being saved on many applications.

The collapsible tap will tap blind holes as readily as open holes, and taps practically any metal, fibre, plastic, or hard rubber with equal ease.

Prices are as follows:

No.	Straight Thread Sizes	Iron Pipe Sizes	Standard Tap Chaser Price	Price
T 30	$\frac{11}{16}$ " - $\frac{7}{8}$ "	$\frac{1}{2}$ "	\$ 95.	\$20.
T 40	$\frac{7}{8}$ " - $1\text{-}\frac{3}{32}$ "	$\frac{3}{4}$ "	100.	23.
T 50	$1\text{-}\frac{3}{32}$ " - $1\text{-}\frac{5}{16}$ "	1"	105.	25.

"No man is born into the world whose work is not born with him. There is always work, and tools to work with, for those who will; and blessed are the horny hands of toil. The busy world shoves angrily aside the man who stands with arms akimbo until occasion tells him what to do. . ."



The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest quality and service at attractive prices.

Write today for prices.

Few Territories Open.

QUALITY TOOL WORKS

Market St.,

Waukegan, Illinois

Level in a Jiffy!

4 sizes: $2\frac{3}{4}$ ", $3\frac{3}{4}$ ", $5\frac{1}{4}$ " and $7\frac{1}{2}$ " closed heights. Self-leveling ball and socket cap.



Simplex Machinists' Jacks cut costs by speeding leveling of work on planers, milling machines, etc. Side lock holds screw at desired height. No. 3A Spreader Jack is invaluable for work in close quarters. Ask your dealer.

Templeton, Kenly & Co.

Chicago 44, Ill.

Better, Safer Jacks Since 1899

Simplex
LEVER SCREW HYDRAULIC
Jacks





ANNIS Production Type

ELECTRIC ETCHER

SPECIFICATIONS—Navy bronze contact plate; Aluminum alloy case 4" x 8" x 10"; Weight 22 pounds; Recessed, heavy duty heat selector switch and pilot light; Handy cord storage compartment; Special current regulating transformer gives smooth etching action with the offset, coolgrip stylus. For operation on regular 110-volt AC lighting circuits. Fully guaranteed. Price \$67.50. Immediate delivery.

R. B. ANNIS COMPANY

204 E. 11th St.

Indianapolis 2, Ind.

LOW COST ELECTRIC FURNACE

A new model electric furnace of low cost and advanced features is announced by Thermo Electric Mfg. Co., Dubuque, Iowa. This furnace, model GTP, has been developed from previous models and fea-



tures a new type of stepless heat control.

With the model GTP, the furnace temperature can be raised or lowered simply by moving a control knob. Any desired temperature between 500° and 1850° F. can be selected and automatically maintained by a TEMCO Control. This is an advantage over the synchronous motor driven type of input controller because it compensates nearly 100% for normal fluctuations in line voltage. It is available for either direct current or alternating current of any cycle.

Inside dimensions of Model GTP are 4" wide, 3 3/4" high and 3-3/4" deep. It is equipped with an indicating pyrometer calibrated in both Fahrenheit and Centigrade Scales.

The heating element is coiled from heavy gauge alloy, and is embedded in the sides and the top and the bottom of the heating chamber. This construction provides both greater protection for the heating element and more uniform distribution of heat. The body and door are one-piece aluminum castings weighing 15 1/2 lbs.

The furnace complete, ready to plug in and operate, is priced at \$57.50 for 115 V. AC. Units for 230 V. and DC also are available.

**WOULD YOU
LIKE TO SPEED UP DRILLING
OF SMALL PARTS?**

DRILL JIGS

*Circle 10
on Reader Service*

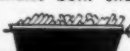


**ESCO Engineering
Corp.**

13413 Euclid Ave.
Cleveland, 12, Ohio

New Nesting Type TOTE PANS

20" Long x 12"
Wide x 6 1/4" Deep
16 Ga., drag holes,
handles both ends.



J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN.

CUT ANY SHAPE BETTER with BEVERLY Throatless SHEARS



The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

Let us send Bulletins giving full details on the BEVERLY LINE —

THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*



J. C. BUSCH COMPANY

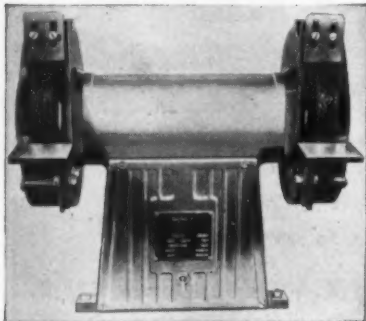
165 SO. BARCLAY ST.

ENGINEERS AND MACHINISTS
SINCE 1907

MILWAUKEE 4, WIS.

FULL-CLEARANCE BENCH GRINDER

A new type of bench grinder, featuring a special small-diameter motor, has been announced by Bardco Mfg. and Sales Co., 2450 E. 23rd St., Los Angeles. Distinct advantage of this new design is the complete absence of any projection in the working area between the two grinding wheels. Not only does this permit unobstructed motion of the work, but it also permits using the grinding wheel much longer than has previously been possible. Be-



cause the diameter of the motor is approximately equal to the diameter of the retaining rings of the grinding wheel, the entire grit portion of the wheel can be utilized.

The grinder base and motor housing are cast aluminum, smoothly designed to shed dust and metal particles. Grinder speed is 3600 rpm.

Models with 7, 8, or 10 inch wheels are now in production. Standard equipment furnished includes: two high-speed organic-bond wheels, one coarse, one medium; two enclosed wheel guards with adjustable tools rests and spark shields; built-in toggle switch.

BRUNER PRINTER-DEVELOPER

Exclusive features of design which speed print production are contained in the new Bruning Model 91 BW Volumatic Printer-Developer.

The new Volumatic is intended for large-volume production of cut sheets, and accommodates roll stock up to 42" wide. It prints and develops all Bruning BW Mediums. Prints are produced in volume at speeds up to 30 feet per minute.

Featured is an extra-large feed board,

CLOSE CENTER MULTIPLE DRILLING IN ONE OPERATION

The CLOCENTER Drill Head, a newly developed multiple drilling head made by the Dorr Sales & Engineering Co., drills holes in sizes up to 1/4 inch diameter in any pattern and number of drills, spacing can be as close as 1/32 inch stock between holes.

The CLOCENTER Head is available in three sizes and in designs suitable for attachment to all models of drill presses, and for application on special machinery. It is especially suited for plastics and non-ferrous metals.

Please submit drawings of drilled parts with inquiry.



SPECIALTY EQUIPMENT & MACHINERY CORP.
230 Park Avenue

New York 17, N. Y.

Offices in principal cities

providing more than 13 square feet of space, for handling large volume production without crowding. Sensitized medium and original copy are drawn into the machine by an exclusive vacuum



feed, and are held in close contact with each other as they are conveyed to the light source. In roll stock production, the

stock is drawn evenly over a ball-bearing mounted stainless steel roller.

Light is provided by a stationary 75-watt per inch mercury arc light, mounted within the revolving Pyrex cylinder assuring uniform light distribution over the entire exposure area of the cylinder (46 inches). For producing photographic prints, a copyflex fluorescent lamp is easily installed.

Original copy and sensitized medium are removed from the cylinder after exposure by an air stream. No moving or metal parts touch the glass cylinder, eliminating scratching or dulling of its surface.

Also provided is a tracing and print separator which provides automatic separation of original copy from the sensitized medium. Suction is applied to the sensitized medium while, at the same time, an air stream separates the original copy from it. For further information, write the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Illinois.

In the beginning, man had five basic tools: pounding, cutting, throwing, lifting and carrying tools.



A Complete Engineering **FORCE IS AVAILABLE**

To tool manufacturers for new designs —

To tool users for plant extensions and improved methods

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Design Service Co. offers to manufacturers the facilities of its organization including 450 engineers, architects, designers and draftsmen.

Complete staffs, maintained in New York, Newark, Cleveland and Philadelphia, are available by the day, week or job.

Tool manufacturers are reducing their engineering costs by using Design Service for complete tool design, patent preparation, or even the production of elementary tracings. Tool users everywhere profit by using this talent in the layout of plant extensions, including tooling-up procedure, structural steel and production methods. Years of experience are available in every phase of the machine tool field.

DESIGN SERVICE SALES CO., INC. 40 EXCHANGE PLACE
NEW YORK 5, N. Y.

FLAT LAPPING MACHINE



A new precision machine tool, designed and built for highly accurate flat lapping operations on both large and small surfaces has been announced. This machine produces the flat planes necessary in sliding and rotating parts, air and liquid tight seals, flat surfaces of plastic molds, drawing dies and pressure pads.

High polish and precision flat finish are said to be rapidly and easily produced on metals and also in lapping glass, quartz and any other material where an extremely flat surface is important. It is claimed that it is possible to obtain a surface finish as fine as 2 rms micro-inches with this machine. Single pieces ordinarily require no holders, chucks or collets. The operator holds the piece on the revolving lapping plate and directs its motion with his hands. Production lapping of large quantities of small parts may be quickly accomplished by using standard or special holders made to suit particular requirements.

This new Spitfire Flat Lapping Machine is made with all gears and bearings sealed. No lubrication is necessary. A minimum of floor space is required—19" x 19".

Extra Lapping Plates, standard or special for various uses are available. These plates are easily installed or removed

without tools of any kind as no bolts, screws or other fastenings are used in holding plates on machine.

For complete information, write Spitfire Tools, Inc., 2933 Pulaski Road, Chicago 41, Ill.

DRAW CUT FLASH TRIMMING MACHINE

The Morton Flash Trimmer is arranged for removing the flash or upset from resistance or butt welds. It can be furnished in sizes ranging from 12" to 28" of trimming capacity and $\frac{1}{4}$ " metal thickness. It has an operating distance approximating 55" from center of rams to the floor which may be varied to suit requirements. This machine is arranged with a lower horn for circular work, such as wheel rims, cylinders or rectangles and will accommodate a minimum diameter of 9".

The operating cycle is automatic. The work is placed over the lower horn. The upper ram unit automatically lowers and clamps the work. The rams trim on the draw-cut or inward stroke and when completed, the upper ram automatically lifts approximately 2" and both rams return to the outward position and stop. The operator can remove the work as



soon as the machine starts unclamping and place another piece in trimming position.

Each Ram is provided with three or more Tool Holders, depending on material thickness and analysis. Adjustable bit type cutters of special design with a fine pitch screw for cutter adjustment are used.

IMPROVED STATIONARY TACHOMETER

New features in the latest development of O-Z stationary Tachometers have been announced. A new construction of pendulum and indicating mechanism is said to have resulted in greatly improved performance.

Among the features of importance pointed out for this newest design are:

1—Free running—a thread will drive the tachometer.

2—Greater sensitiveness to speed fluctuations without lag.

3—Elimination of all flutter or hunting of hand, even under adverse driving conditions.

4—Greater accuracy. The manufacturers guarantee $\frac{1}{2}$ of 1% in either direction of rotation.

5—Longer life under continuous and hardest working conditions.

6—Adapted not only for high speeds but also very low speeds, even inches or feet per minute.

7—High ratio up to 1 : 40.

8—Adaptation as Hand Tachometer without gear shift, yet wide range, for heavy duty.

A bulletin has been issued which de-

scribes and illustrates the tachometer. This and information about other products by this company may be had by writing to Dept. BB, O. Zernickow Co., 15 Park Row, New York 7, N. Y.

Joseph Bramah, about the eighteenth century invented a new type of lock, inspiration being ancient Egyptian patterns and then conceived machine tools to manufacture the locks.

PLASTIC SHEET CREASER

Designed and developed to expedite efficiency of creasing or folding of cellulose acetate, ethyl cellulose and other thermoplastic material by putting this essential sheet plastics fabricating operation on a precision-production basis, "Thermocreaser" is announced by the Plastics Equipment Division of Taber Instrument Corp., North Tonawanda, N. Y.

This new development, reported capable of producing a 90° crease or fold on 5-to-20 pt. plastic up to 30" in width, provides "thermostatically-controlled instant-crease" action.

Crease or fold is made thru extraction of heat from thermostatically-controlled blade and penetration of released heat



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Increases
SPEED
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ACCURACY

More and more machine tool builders are using VIMCOLIGHTS as standard equipment on their machines. VIMCOLIGHTS provide greater machine efficiency at remarkably low cost. If our standard models do not fit your needs, we will design one that will.

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MFG. COMPANY, Inc. 105 BRAYTON ST. BUFFALO 13, N. Y.

**MADE OF ALLOY STEEL
MILLED FROM BAR**

SOCKET HEAD
CAP SCREWS



**ECONOMY
MACHINE PRODUCTS
COMPANY**

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Your inquiries for special tooling are solicited and will receive prompt efficient service. Let us help you solve your tooling problems.

GAGES, FIXTURES, SPECIAL TOOLS

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Andersons, Inc.



2329 NELSON ST., CHICAGO 18, ILL.

into the sheet stock, softening and creasing it as the blade presses the material into a metal forming die or a resilient rubber pad. Time element varies, with lighter gauges being creased almost instantly and heavier thicknesses taking but slightly longer. Trial creasing or folding of a few small pieces quickly determines actual time required and best operating temperature in any instance.

The machine is a "two-in-one" unit, so named by virtue of the fact that it makes practical precision-creasing or folding of thermoplastic sheet on either a metal die or a rubber pad.

The Thermocreater operates on 115-volt or 230-volt a-c or d-c circuit and ordinarily produces maximum results on most thermoplastic-type sheet stock at a temperature of 240°F. Taber engineers further report. Operating controls include current and thermostatic control element indicator lights, temperature regulation thermostat, blade temperature thermometer, and adjustable back gauges.

Further data available to production superintendents, plant managers, methods engineers or other interested executives



on request. Write to Plastics Equipment Division, Taber Instrument Corp., Dept. MTB, 111 Goundry St., North Tonawanda, N. Y.

SPRAYWELDER

A powder metallizing unit, the Colmonoy Spraywelder, has been announced by Wall Colmonoy Corp., 19345 John R, Detroit 3, Mich.

The spraywelder was developed for use in conjunction with the Colmonoy Sprayweld Process. While the unit was primarily designed for spraying Colmonoy alloys, it will handle other powdered compositions equally well. With this unit it is possible to combine both welding and metallizing procedure. The unit is operated in the first part of the process as a powder metallizing unit to apply a uniform overlay of alloy. It is then used as a conventional welding torch to fuse this sprayed overlay to the base metal to obtain a fusion or molecular bond, identical to that obtained when the alloy in rod form is applied by acetylene welding.

The Spraywelder unit consists of the gun, all necessary hoses, with connections. The hopper for the powdered metal and the carburetor are combined. In addition a panel to hold the equipment is provided.

MARKAL HEAT-PROOF PAINT

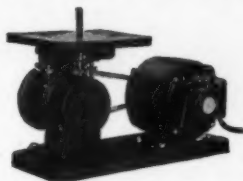
Protection against corrosion and scale at higher temperatures than ever before is the prime advantage of the new Markal Heat-Proof Paint made by the Markal Co., 607 N. Western Ave., Chicago 12, Ill. It is a functional paint and will prevent hot metals from corroding and scaling at temperatures as high as 1850°F. It will provide protection to metals in all weather conditions. The hot metal can be subjected to sudden temperature changes such as quenching immediately in cold water without cracking or peeling of the

paint. Markal Heat-Proof paint follows the contractions and expansions of the metal at all temperatures.

It is ideal for smoke stacks, annealing boxes, exhaust manifolds, furnace pipes, mufflers on trucks and tractors, etc. The paint is applied while the parts are cold. It dries in about 20 minutes and can be subjected to the red hot temperatures immediately after drying. This paint is not merely heat-resistant, but heat-proof.

SPEED UP

your tedious hand filing
of dies with this



POSTEL DIE FILING MACHINE

Complete (without motor) **\$45.60**
F.O.B. Minneapolis

POSTEL MANUFACTURING CO.

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Minneapolis 11, Minnesota

'STAR DUST'

LABORATORY GRADED
PURE DIAMOND POWDERS

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
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- Complete range of grit sizes

There is a STAR DUST Field Serviceman in your territory.

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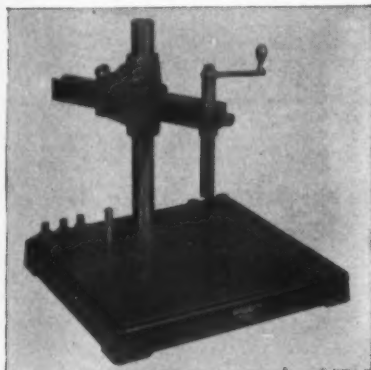
STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

**Precision LAPPING
POWDERS for
PRECISION work**



PRODUCTO MIDGET HAND TAPPER

A new precision small size Tapping Machine has been added to the line of Producto accessories for tool and die shops. The machine is adapted for bench



purposes and has adjustments so that the tap spindle can reach any working point within the size of the table. It has a capacity of from No. 4 to $\frac{1}{4}$ " Taps inclusive. The size of the base is $15\frac{1}{2} \times 15$ ".

Producto Hand Tappers, now made in three sizes, are a desirable item to any tool room. This new machine is for use on accurate die and fixture work.

The Midget Hand Tapper has removable spindle with driving handle. The spindle accommodates individual bushings for all tap sizes within the capacity of the machine. The overall net weight of the tapper is 62 pounds. The product was developed by the Producto Machine Company, Bridgeport 1, Connecticut. Write Dept. BB.

FORK-TYPE PALLET TRUCK

Designed to handle reels or similar bulky cylindrical items, this special-model pallet truck is a modified version of the famed Transporter battery-powered hand truck pioneered and manufactured by Automatic Transportation Company, 149 West 87th Street, Chicago 20, manufacturers of electric industrial trucks.

Forks are engineered and widened to straddle the reel when in lowered position and to lift it from the floor when raised.

Drive unit and operation are identical

FACTORY

guaranteed

NEW EQUIPMENT

IMMEDIATE DELIVERY

from CHICAGO STOCK!

BENCH GRINDERS
SHELDON LATHES
POWER HACK SAWS
RADIAL ARM SAWS
FAMCO FOOT SHEARS
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DYER SPOT WELDERS
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DRILL PRESS VISES
L-W DIVIDING HEADS
FAMCO KICK PRESSES
NEBEL ENGINE LATHE
U. S. HAND MILLERS
ARMOR HAND MILLERS
FAMCO ARBOR PRESSES
SKINNER LATHE CHUCKS
BUTTERFLY DIE FILERS
WHITNEY FOOT PRESSES
O.B.I. PUNCH PRESSES
TROYKE ROTARY TABLES
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P & H ELECTRIC HOISTS
GLOBE TUMBLING BARRELS
MACHINISTS BENCH VISES
SKILSAW PORTABLE TOOLS
MILLING MACHINE VISES
LEACH SURFACE GRINDERS
LOWN SLIP ROLL FORMERS
ERRINGTON TAPPING HEADS
PEXTO SLIP ROLL FORMERS
SHELDON MILLING MACHINES
SPIEGEL COOLANT SYSTEMS
BUFFING-POLISHING LATHES
BEVERLY THROATLESS SHEARS
WYSONG & MILES FOOT SHEARS

ALLIED

MACHINERY & SUPPLY CO.

548 W. Monroe St., Chicago 6

FRANKLIN 9874

to those of the standard Transporter, the only modification being the forks. The unit was originally designed according to specifications of the General Cable Company, which uses the truck to handle reels of finished cable in the manufacturing plant.

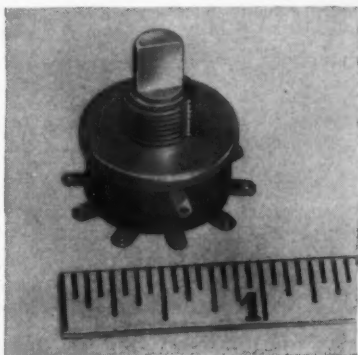
The truck shown is designed for handling reels of 54" diameter and 38" wide. Forks are 45" wide at the outside, mounted on a standard 4000-pound load capacity Transporter. These specifications may be adapted by special order for any particular size and type of reel.

MINIATURE ROTO SWITCH

A new miniature roto switch only $\frac{3}{4}$ " in diameter and 13/32" depth with a contact pressure of 2½ pounds has been developed by Grayhill, Chicago. Termed the Series 5000 Roto Switch, the novel apparatus can be used in almost any circuit combination up to 5 amperes, breaking up to 1 ampere at 110 volts.

A main feature is its 360° rotation in either clockwise or counter-clockwise direction.

With many applications in the electrical and electronic fields, the Series 5000 Roto Switch has been made available in both shorting and non-shorting types. Shafts either for knob or screw adjustments are provided.



The manufacturer is Grayhill, Dept. BB, 1 North Pulaski Rd., Chicago 24, Ill.

Specify **HALL...**



PRECISION LEVELS

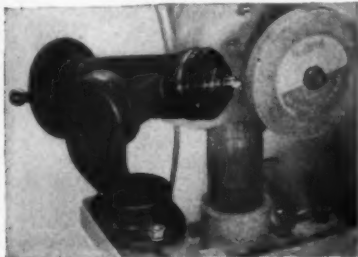
No. 5 Adjustable Type Machinist Level with Ground and Graduated Vial, "V" Grooved for Use on SHAFTING. Sizes 4", 6", 8", 12", 18". Aluminum Torpedo Levels, Aluminum Line Levels. Also Carpenter's and Mason's Levels up to 48" in length. Bench and Pocket Levels for every use.

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**Address Orders or Inquiries to
HALL LEVEL AND MFG. WORKS**
(Established in Geneva, Ohio in 1913)
1121 E. 4th St. Austin, Texas

RELIEF GRINDING FIXTURE

Added to the line of relief grinding fixtures manufactured by Accurate Machine Products Co., 1640 South Hobart Blvd., Los Angeles 6, is Model 100-B, a new I-G-C Relief Grinder designed to handle countersinks of all types, center drills, integral pilot cutters and pilot drills, either right or left hand. It is also



useful for any type of small tool cutter grinding, such as the sharpening of end mills, spot facers and small milling cutters.

The mounting knee has been redesigned so that the working head of the fixture can be set in any desired position, giving the correct rake or clearance angles to the cutters to be ground.

A new head with special built-in indexing pins takes the place of old-fashioned, time-consuming finger set-ups and resulting in more accurate and faster grinds. The manufacturer says cutters ground on the 100-B require less frequent grinding because of their equally ground cutting edges.

Model 100-B fits any standard grinder and handles work from 1/16" to 1" in diameter with standard collets. Lift of the single cam is variable from .001" to 1/8". Adjustment pins are provided for 1, 2, 3, 4 and 6 fluted cutter grinding. Spindle is of hardened and ground steel. Cam and pins are of hardened tool steel. Body and knee are cast iron with an attractive mottled finish. Model 100-B is available for immediate delivery and comes complete, ready for installation, with one Hardinge Type 5-C Collet and two wrenches. Weight is only 22 1/2 pounds.



The Complete Line
for Every
Industrial
Purpose



GROBET FILE CO. of AMERICA
421 Canal Street New York 13, N. Y.

Square, Straight Tapping in HALF THE TIME



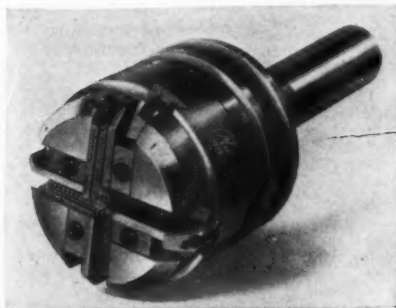
The Dahlstrom Tap Guide practically eliminates tap breakage, and turns out uniform work. Just fasten it to a post or bench, slip a Tap Adaptor into the spindle, and turn the handle. Equipped with 7 Adaptors from 8-32 to 1/2" (taps not furnished). Literature on request. Dahlstrom Mfg. Co., 416 South Sixth St., Minneapolis 15, Minn.

Dahlstrom TAP GUIDE

MURCHEY CHASER DIE HEADS

A feature of the new tangent chaser die heads, developed by the Murchey Machine & Tool Co., Detroit, Mich. is the quick removal and replacement of chasers and chaser holding blocks, usually without removing the tool from the machine. The operator can replace blocks and chasers previously set to exact location in a micrometer setting fixture. Thus, one die head with extra chasers and blocks takes the place of two or more complete setups and reduces machine down time.

These die heads are furnished in revolving and stationary type with chasers and holding blocks interchangeable. Illustrated is type TRB, a rotating yoke operated tool for use on automatic screw machines, drill presses, or any machine where the tool revolves. With these tools,



chasers of a given pitch may be used to cut any size within the range of the head. All parts are hardened and ground and the company announces that literature covering the new development is now available.

BREMIL MFG. COMPANY

1700 Pitts. Ave.,

Eric, Pa.

ALL-ALLOY compound lever strap cutter. Cuts $1\frac{1}{4}$ strap with one stroke.



*Now You
Can Bend It!*

FAST

ACCURATE

UNIFORM

SELF

ADJUSTING

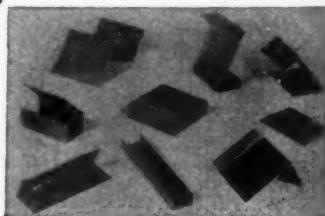


YOU
CAN
ALSO

AFFORD IT

The Bendmore handles material up to $3/32$ " thick a full 12" wide. Good, clean bends up to 135° . The machine is ruggedly constructed of semi-steel castings, the operating cam and steel insert in ram are heat treated to resist wear and give long life. Prompt delivery.

Write for literature. Dept. HB.



Carl Wirth & Son

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JOHN'S

DRILL JIGS

for...

TAPPING MACHINES



The easiest way to cut production costs on drilling and tapping jobs is to use John's Drill Jigs.

These sturdy jigs are now provided with universal jaws which permit quick setting for end drilling and tapping. The reversible V-plates accommodate a broad range of diameters.

Let us send details.

HEUSER MFG. CO.

1638 N. PAULINA ST.
CHICAGO, ILLINOIS

Immediate Delivery FROM STOCK

GREAVES-SILENT BAKELITE GEARS



No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads... their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time... Money... Labor!

We also make silent gears of rawhide and Fabril.

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FOR ORDERING
GUTTING THEIR OWN
GEARS, WE CAN
MAKE IMMEDIATE
DELIVERY ON
BLANKS SAWED TO
SPECIFIED
DIAMETER AND FACE

Greaves MACHINE TOOL CO.

2013-13 Eastern Ave.
Cincinnati, Ohio

HYDRO-POWER HYDRAULIC BOOSTER

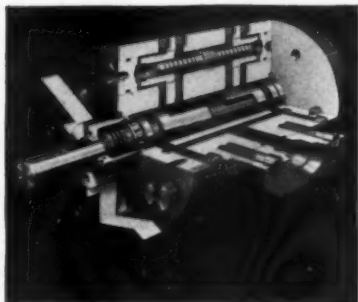
A newly developed oil-hydraulic pressure booster, capable of supplying pressures up to 7500 pounds, is announced by Hydro-Power, Inc.

This company reports that new fields of application in high pressure hydraulics are opened by the new unit, which makes available working pressures substantially higher than those normally obtained with high pressure pumps.

A compact, multi-plunger intensifier, the Hydro-Power booster will multiply by as much as three times the pressure of the oil it handles in a hydraulic circuit. The power unit comprises a cylinder block having a nest of six parallel bores, each fitted with a reciprocating, double-acting piston. A central rotating valve member connects the pistons with the source of pressure fluid. As the valve rotates, the oil connections are made successively to the pistons, alternating from one end to the other to provide an uninterrupted pressure flow.

The new booster operates without any appreciable increase in system horsepower, requiring additional power only for the rotation of the central valve. The drive shaft is an integral extension of the valve itself, providing a direct drive for the latter.

High pressure operation can be used in conjunction with low pressure pump. High pressure pumps are not required, nor are operating valves needed to con-



trol the high pressure circuit. In newly developed equipment, smaller cylinder and ram assemblies can be employed. Rams can be reduced to one-third of normal size, with resultant faster operating speeds. Automatic slow-down occurs

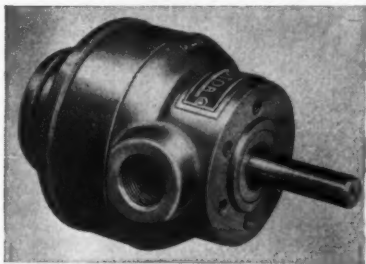
whenever high pressure is applied.

The body of the booster houses the entire assembly and provides a means for porting both suction and discharge. Flanged connections provide an easy means for connecting the unit to the hydraulic operating system, while the end covers, with feet cast integral, permit mounting of the booster in many positions. A means of maintaining initial preloading without dismantling the booster is provided by a bearing adjusting nut.

Hydro-Power Boosters are built in two standard sizes, 35 and 100 gallons per minute input. Each size is available in two distinct pressure ranges: $2\frac{1}{4}$ to 1 and 3 to 1. Volumetric output is in inverse proportion to the pressure ratio. All units have a maximum discharge pressure of 7,500 psi.

Complete information and specifications are contained in Bulletin 460, available on request from Hydro-Power, Inc., Dept. BB, Belmont & Sheridan Aves., Springfield, Ohio.

HIGH-PRESSURE HYDRAULIC PUMP ANNOUNCED

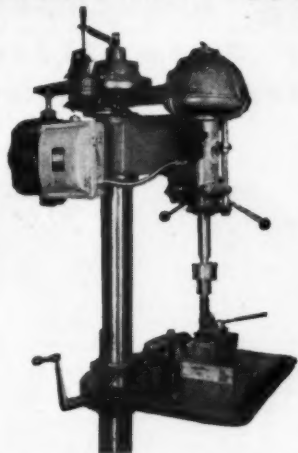


A hydraulic pump of new design, for higher operating pressures, is reported by the Gerotor May Corporation. Identified as Type QH, this basically improved pump model is already in production and offered for early delivery.

Essentially, pumps in the QH series feature the Gerotor gear mechanism in a stronger, heavier body. Designed for operating pressures up to 1500 p.s.i. intermittent or 1200 p.s.i. continuous, the QH series is available in capacities of 3, 5, 8 and 12 g.p.m., for plain base or flange mounting.

For more information write to Dept. BB, Gerotor May Corp., Baltimore 3, Md.

THREAD-ALL Tapper



PRECISION TAPPING !! LICKED !!

By Converting Any Drill Press into
a Precision Tapping Machine.

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to $1\frac{1}{2}$ " with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

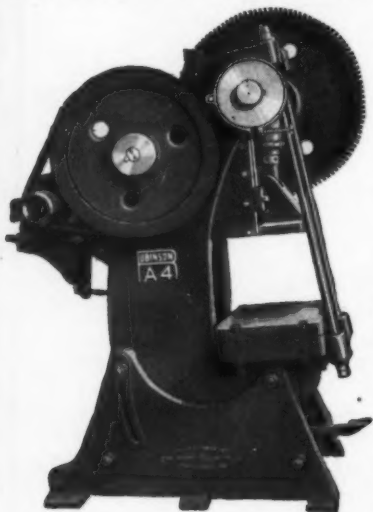
Taps right or left hand without adjustment.

Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

Write for full details.

GRUEN GAUGE CO.
10039 Marcus Ave. Detroit, Mich.

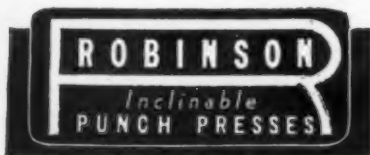
Long Recognized for durability strength and service



● The new improved Series A Robinson Punch Presses retain all the sturdy characteristics of their predecessors with added safety, speed, strength and ease of operation and maintenance. Available in five sizes.

Send for descriptive Bulletin No. 7.

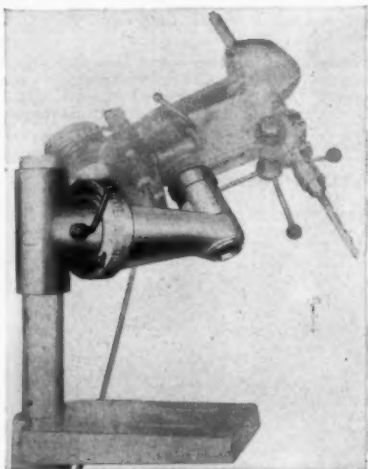
New Albany Machine Mfg. Co.
New Albany, Indiana, U.S.A.



EMPIRE ALL ANGLE RADIAL ARM

The Empire Foundry & Machine Corporation, Ashland, Kentucky, announces the development of an All Angle Radial Arm to be mounted on standard 2", 2¼", 2½" or 2¾" column drill presses. It eliminates the necessity of a tilting or universal table for drilling holes at any desired angle and almost any radius. The arm increases chuck-to-column capacity by 16", and auxiliary column increases chuck-to-column capacity by 16", and auxiliary column increases chuck-to-base capacity five inches. A 15" steel or bronze auxiliary column can be furnished.

The radial arm is clamped firmly to the base collar by bolts thru a degree table



graduated thru 90° (45° right to 45° left) which permits adjustment of the drill head to any desired drilling angle. The base collar is equipped with a coordinate clamp lock with a ball handle that releases or tightens two clamping wedges simultaneously; this simplifies raising or lowering drill head and permits swinging the drill head and radial arm. Auxiliary column is clamped by two set screws which tighten flush with surface.

Standard drill press table or bed can also be mounted on radial arm. By using radial arm on both the drill head and table, drilling from nearly any angle is possible.

ERRINGTON MECHANICAL LABORATORY

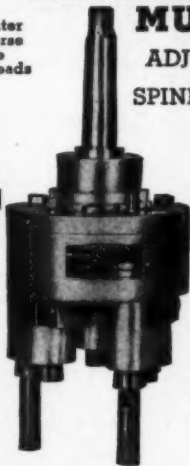
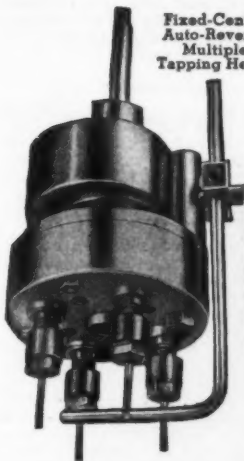
STAPLETON, STATEN ISLAND 4, N. Y.

6701 N. SIOUX AVE., CHICAGO

MULTIPLE HEADS

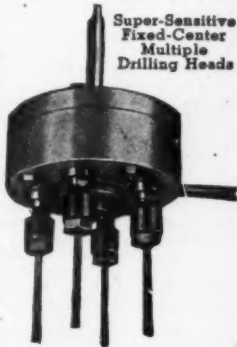
ADJUSTABLE MULTIPLE
SPINDLE DRILLING HEAD

Fixed-Center
Auto-Reverse
Multiple
Tapping Heads



All Parts
Fully
Enclosed
to Insure
Pressure
Lubrication
and
Rigid
Support of
Adjustable
Spindles

Super-Sensitive
Fixed-Center
Multiple
Drilling Heads



MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations

Photo shows a special operation not suited to standard straddle mill set up but easily handled by means of a RUSNOK Milling attachment used horizontally on a standard milling machine, saving one machining operation and accomplishing greater accuracy in finished piece parts. Uses many types of cutters on a wide range of work. Easily mounted—tilts in any angle. Large size spindle (No. 9 B & S taper). Takes 1/2" to 3/4" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. 1/2 h.p. motor. Specially engineered by RUSNOK to meet modern demands for high speed, high precision, heavy duty and mill operations.

Prompt delivery.

Write for illustrated circular and prices.



RUSNOK TOOL WORKS

4840 WEST NORTH AVE.

CHICAGO 39, ILL.

SW-2 ELECTRODES ANNOUNCED BY WESTINGHOUSE

For rapid and economical welding of mild steel in all positions and with alternating-current or either polarity direct-current, straight preferred, the new SW-2 electrode, available in four diameters from 3/16-inch to 5/16-inch, is announced by the Westinghouse Electric Corporation.

SW-2 electrodes were developed in the larger diameters to provide electrodes having the desirable characteristics of the Westinghouse SW electrodes which have been manufactured in diameters of 3/16-inch and below, for a number of years. Welds made with SW-2 meet the requirements of AWS-ASTM specifications for classifications E-6012 and E-6013, but have the very desirable characteristics in respect to flat contours, side wall wash-up, freedom from undercutting, and extreme ease of slag removal, that are obtained with Westinghouse DH electrodes (AWS-ASTM classification E-6020 for flat and horizontal work.)

Further information on the SW-2 electrode may be secured from P. O. Box 868, Westinghouse Electric Corporation, Pittsburgh 30, Pennsylvania.

INDIRECTLY HEATED— THERMOSTATICALLY CONTROLLED MELTING AND DIPPING EQUIPMENT

For use in heating, melting, dipping, and pouring critical compounds such as wax, paraffin, oils, fats, pitch, hydrolime, battery, transformer, resistor, and capacitor compounds, two new groups of indirectly heated, fully insulated, thermostatically controlled melting tanks have just been developed by Aeroil Products Company, Dept. BB, West New York, New Jersey.

These new tanks are built on the double boiler principle to insure complete uniformity of accurately controlled temperature on all four sides and bottom of the inner vat that contains the materials to be melted. Built-in thermostatic controls hold temperature rigidly at any desired point from 100° to 550°F in fully insulated units that are cooled to the touch.

Both gas-fired and electrically heated equipment are available. Gas-fired units are heated from the inside by means of a patented immersion tube system that is claimed to result in savings of up to 50% in time, labor and fuel as compared with old-fashioned bottom fired heating methods. The electrically heated equip-

ment is available in both 40 gallon size installations (equipped with heating elements of 13-KW total capacity) and smaller portable 15 gallon capacity tanks that can swiftly be wheeled where and when needed thruout the plant. Free illustrated Leaflet No. 581 with complete details of specifications available upon request from manufacturer.

THERMOCOUPLE FOR ANY PYROMETER

Better heat treating is claimed to be possible with this new thermocouple. Supplied with either No. 8 ga. standard chromel alumel or iron constantan element, they can be used with any make of pyrometer.

Temperature control is obtained by the use of a 3/8" O. D. heavy seamless drawn inconel protecting tube which fits thermocouple element closely for sensitivity of response.

Less time is said to be required for inspection and assembly since terminal head is designed so that thermocouple can be quickly inspected without disconnecting leads or using a screw driver. Thermocouple wires also enter connector without bending. This feature is of advantage to companies who assemble their own thermocouples. The thermocouple element is replaced by loosening two screws. High grade ceramic connector body withstands high temperatures.

These thermocouples are recommended by the manufacturer for all general heat treating service including neutral salt baths; except sulphurous atmospheres, on which Cat. No. 212 (25% chrome, 20% nickel) protecting tubes should be specified. Immediate delivery can be made from stock on all standard lengths from 12" to 48" inclusive in multiples of 6"; and 60" to 144" inclusive in steps of 12".

For further information write to Arklay S. Richards Co. Inc., 56 Winchester St., Newton Highlands 61, Mass.

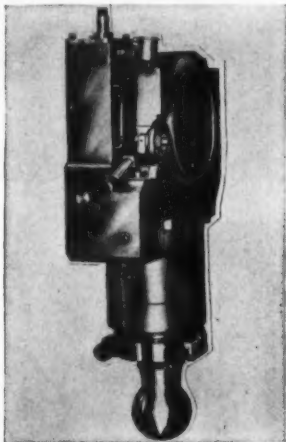
Without the machine, human life could exist only on the plane of previous eras—greatly restricted and much less desirable. With the machine from which we are now inseparable, the remarkable progress already made to improve human living conditions is yet extremely small when compared to the astounding advances now in the making.

Decalcomanias which stretch are now being used on rubber.

SAFETY OVERLOAD CONNECTING LINK

The Dayton Rogers Manufacturing Co., Dept. BB, Minneapolis, Minnesota is now announcing a new Model HP Safety Overload Connecting Link, which may be applied to all punch presses by replacing the present conventional pitman, or connecting rod, and ram adjusting screw.

This Hydraulic Safety Overload Connecting Strap is arranged to give the necessary tonnage protection within the



maximum tonnage capacity of the punch press. It not only protects the crank and press frame, but also can be so arranged as to protect any of the tools used in the press. It will also compensate for stock thickness variation or the inserting of two blanks on a forming die on all operations, such as forming, pressing, riveting, briquetting, assembling, etc., because a constant ram pressure is assured at the point of operation at all times. It is now being built in various sizes for press capacities from 37 to 250 tons.

The origin of the word, "jig", may be traced to Eli Whitney, inventor of the cotton gin. Whitney used what his assistant called a "thing-a-ma-jig" to hold work while it was being turned. For the last 140 years, mechanics have called any device which holds a piece of work a jig.

The MAXWELL Precision Boring Head

★
MAXIMUM
CAPACITY

★
MAXIMUM
ACCURACY

★
UNCONDITIONAL
GUARANTEE

★ .0002
ADJUSTMENT

★
MAXIMUM QUALITY

★ MINIMUM PRICE

• 3 sizes from \$44.00 to \$105.00. Boring capacity $\frac{3}{8}$ " to 15". Available with any standard shank. Immediate delivery from stock. Circular upon request.

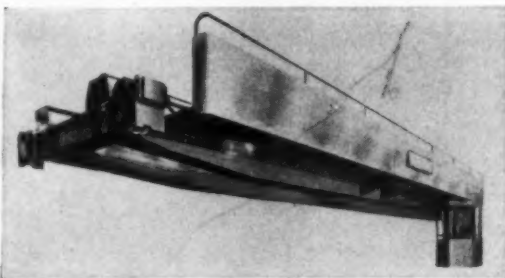
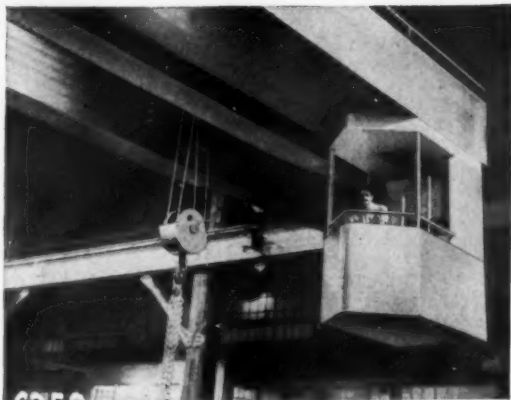
THE MAXWELL CO.

220 BROADWAY • BEDFORD, OHIO

COLOR AIDS CRANE OPERATION

The crane pictured was built by the Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich. To follow modern trends, it is stream-lined and attractively colored. The hoisting trolley, lower block and hook, the handrail on the platform, and the handrail and edges on the cage are painted a brilliant orange, contrasting strongly against the machinery blue of the end trucks and girders. The interior of the operator's cage is buff, while the side panels and top of the cage are a light grey. The outside of the idle girder, the walk-way along the driving girder, and the back and sides of the operator's cage are sheathed with corrugated aluminum.

These improvements in the Shaw-Box crane are functional; the sheathing along the platform serves as a guard against anything dropping from it to the floor. The new design of the cage admits greater visibility. The use of color on the working parts of the crane increases its safety features, according to the manufacturer,



since the contrasting colors attract the attention of those working under it with a greater degree of safety.

WESTINGHOUSE A-C WELDERS

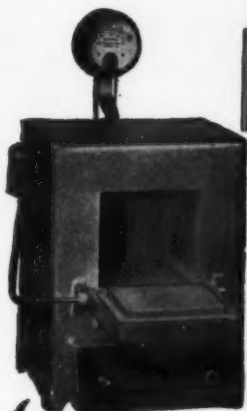
Construction details, electrical specifications and application data on the complete line of A-C transformer type welders are contained in a booklet announced by the Westinghouse Electric Corporation.

Detailed information is given on the 500 and 400-ampere industrial welders for fast, steady production; the 300-ampere welder for heavier-than-average work; and the general duty welders ranging from 20 to 250-amperes. Electrical specifications and performance data are presented in chart form for easy reference. The

booklet is fully illustrated with interior views and close-ups of special features, as well as exterior views of each model. General application information concerning recommended electrodes is also included.

According to the booklet, A-C welders will increase speed 20 to 30 per cent, reduce power costs one-third, and reduce maintenance costs.

Copies of the booklet (B-3548) may be secured from the Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.



NEW TEMCO MODEL C E A

ELECTRIC FURNACE

The new MODEL C E A has been designed to give superior performance, with ease and economy of operation, at a low initial cost. It will stand hard use and is an ideal furnace for general laboratory purposes, heat-treating and small unit production.

SPECIFICATIONS

Temperature Control — Any temperature from 500° F. to 2000° F. can be selected and automatically maintained with the TEMCO variable temperature control.

Pyrometer — Indicating type calibrated in both Fahrenheit and Centigrade scales.

Dimensions—Inside 4 1/4" wide, 4 1/4" high, 6" deep. Outside 12" wide, 15 1/2" high, 14 1/2" deep.

Prices Model C E A Complete

For 115V.—A.C. only....\$90.00

For 115V.—A.C. & D.C. 85.00

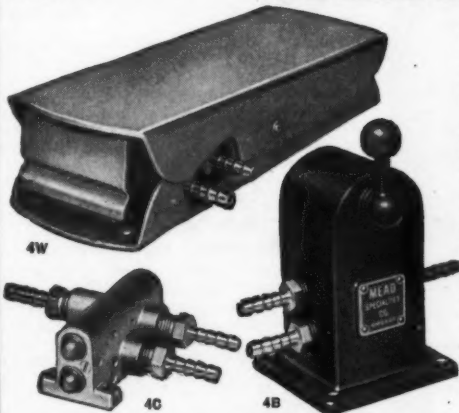
For 230V.—A.C. only.... 85.00

- Heats up to 1500° F. in 30 minutes.
- Can be operated continuously up to 2000° F.
- Embedded heating element protected against damage and chemical deterioration. Muffle core easily replaceable.

- Heating element, special high temperature alloy, completely surrounds heating chamber assuring the most uniform distribution of heat.
- Insulated with highly efficient, lightweight materials cast permanently into furnace body.

See your supply house or write for literature. Other sizes available.
THERMO ELECTRIC MFG. CO., 486 W. Locust St., Dubuque, Ia.

READY.. the New MEAD Combination 3 or 4 Way AIR VALVE



This new, ingenious MEAD VALVE is almost universal in its uses yet is so simply constructed it gives long, troublefree service. No sliding closures . . . 1/16" movement operates from full open to full closed helping speed of action, minimizing operational fatigue.

4B BENCH VALVE . . . for use on machine table or bench. Functions as a 4-way valve . . . two 3-way valves . . . one 3-way valve . . . and as a 3-way valve and a blower!

4W FOOT CONTROL . . . pedal works valve either as 3-or-4-way. Adjustable pedal stop provides quick change from 3-way to 4-way. Same combination of functions made by rocking pedal as by moving lever of bench valve.

4C FOR CAM OPERATION . . . can be mounted on drill press, etc., for automatic control of air cylinder by suitable cam.

WRITE for new Air Power Catalog describing Mead's Air Vises, Clamps, Presses, Workfeeders, Controls, etc. Just off the press!

MEAD SPECIALTIES COMPANY

4114 NORTH KNOX AVE.

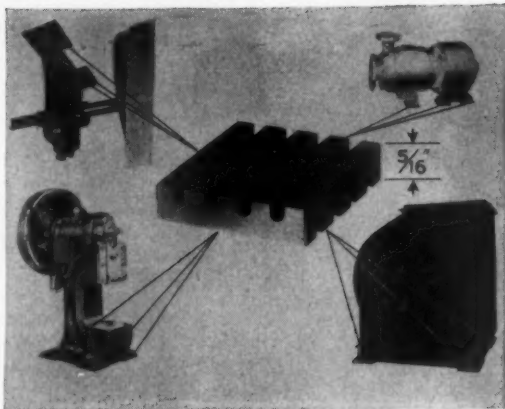
DEPT. YA-47, CHICAGO 41, ILL.

THE MB ISOMODE PAD

An effective utility pad for use under all types of machinery as mounting pads and vibration absorbers is announced by the MB Manufacturing Co., Inc., Dept. BB, New Haven 11, Conn.

The MB Isomode pads are made of live, oil resistant Neoprene, designed to insure ruggedness, efficiency, and long life. They are effective on many different types and sizes of equipment, from typewriters to forging hammers. Standard pads are 18" square, 5/16" thick, and can be cut to any size desired.

Used as a mounting pad or machine base, Isomode pads reduce the time required for installing or removing machinery by eliminating the need for hold down bolts, skids, concrete mats, or grouting, thus permitting immediate relocation of machinery when necessary.



Uneven floors present no problem, since the pads are self-adjusting shims, compensating for variation in floor surface. The resilience of the pad absorbs all impact stresses existent during operating of rigidly attached machines, as well as reducing noise and vibration.

PORTABLE SHAKER SCREEN

A portable motor-driven shaker screen for us with deburring and finishing barrels is announced by Almeo Incorporated, 231 East Clark St., Albert Lea, Minn. This



unit quickly separates the finished work from the tumbling medium, eliminating all hand screening and sorting.

The screen is driven by a 1/2 hp or 1/3 hp motor, and vibrates in an elliptical path at 380 reciprocations per minute.

Length of movement is adjustable from zero to 3/4" to meet all requirements. Interchangeable wire screens are available in standard sizes from 3/64" to 2 1/4" openings.

One screening unit will normally serve 3 or 4 barrels; Its over-all height of 24" (exclusive of the handle) permits this unit to be placed directly under tumbling barrels to separate the load directly on discharge; there is clearance beneath the screen for a mobile hoist pan to receive the screened material.

NATIONAL SUPPLY COMPANY DESCRIBES R-3 SWIVEL

An 8-page bulletin describes The National Supply Company's Ideal Type R-3 Swivel for rotary drilling rigs. It carries nine explosion photographs, a blueprint, complete specifications and description of how the Swivel is constructed. Also included is a chart showing the life expectancy of the main bearing.

The bulletin No. 343, can be obtained by writing Dept. BB, The National Supply Company, P. O. Box 899A, Toledo 1, Ohio.

ALL PLASTIC SAFETY GOGGLE

A lightweight all-plastic safety goggle with air-conditioned eyecups that reduce possible fogging of lenses is announced by American Optical Company, Southbridge, Mass. Through its design and plastic lenses, the new A-O Panoram goggle protects eyes against particles striking from any direction on jobs such as chipping, grinding, babbitting, riveting, hand tool and machine operations, rail cutting, spike driving and similar operations.

The plastic frame and eyecups afford a large area of protection, and provide for exceptionally wide-angle vision. The design of the eyecups, plus the swivel center, enables the cups to lie back against the face, conforming closely to facial contours. This relieves pressure on the bridge, distributing the light weight of the goggle throughout the eyecups. Perforations at the top and bottom of the eyecups ventilate the goggle and reduce the possibility of fogging.

The A-O Panoram goggle has a floating saddle bridge, shaped and positioned to fit against the nose comfortably without pressure. Large plastic lenses which meet high optical standards efficiently resist the impact of flying particles. Clear and green lenses are available. The green lenses reduce excessive glare and absorb ultraviolet radiations. A swivel rod in the center of the goggles with clamping nut at the top enables the lenses to be replaced easily and quickly. The goggle may be worn over most types of prescription glasses and its frame is available in two colors—clear or green.

Electronic experts now suggest the television camera to inspect surfaces of metal, cloth or rubber while these move thru processing to give instantaneous quality revealing pictures anywhere along the line.

STANDARD PARTS



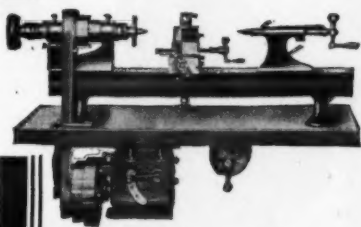
FOR
JIGS, FIXTURES,
DIES, GAGES, TOOLS
AND MACHINERY

Featuring
Hand Knobs, Quarter
Turn Screws,
Spherical Washers,
"C" Washers, Jig
Feet - Locating Keys

Write for Catalog No. 2
Inquiries for Tool Die
and Mold Estimates
Invited.

GEORGE F. BUB AND SON
11413 MADISON AVE. CLEVELAND 2, OHIO

"Stark" PRECISION BENCH LATHES



Open cone lathe
With motor drive unit

NOW IS THE TIME

to send us for prompt and correct re-conditioning, your Starks, either the old ones, which in many cases can be made almost as accurate as new, or your newly acquired War Stark Lathes.

Favorable deliveries and reasonable prices for high class work

Write to us.

Stark Tool Company
WALTHAM, MASS.

Established 1862

*Originators of the American
Bench Lathe*

HAMMOND POLISHING AND BUFFING LATHE

An addition to the Hammond of Kalamazoo line of Polishing and Buffing Lathes is the "ROL" model. This lathe has an overhanging base to provide



liberal working space around the wheel, will accommodate either 2 or 3 hp motor

and is multi-V-belt driven from a motor mounted inside the base. Any single spindle speed can be attained from 1200 to 1600 rpm.

Hammond also announces a new polishing machinery catalog, No. 55, which carries specifications covering their complete line of polishing and buffing machinery. A request to Hammond Machinery Builders, Inc., 1600 Douglas Ave., Dept. BB, Kalamazoo 54, Mich., will receive prompt attention.

AP-MO ELECTRODES ANNOUNCED BY WESTINGHOUSE

For direct-current reverse polarity welding only of low alloy cast steel or low alloy high tensile strength rolled steels in all positions, the new AP-MO electrode, available in three diameters from 1/8-inch to 3/16-inch, is announced by Westinghouse Electric Corporation.

This electrode is designed for making butt and fillet welds in all positions and welds made with it meet the requirements of AWS-ASTM tentative specifications for Iron and Steel Arc Welding Electrodes Classification E-7010.

Further information on the AP-MO electrode may be secured from P. O. Box 868, Westinghouse Electric Corporation, Pittsburgh, 30, Pennsylvania.

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over 5000 shapes and sizes

Buy **GROBET** and
get the file you need

for a specific purpose — we do not attempt to substitute or sell "near as good". No one ever attempted to compile such a complete line — only GROBET has the record of well over a century of performance and leadership in designing precision Swiss files.



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IMPORTERS OF GROBET SWISS FILES

MFRS. OF GROBET ROTARY FILES

Plants, New York • Chicago • Los Angeles

ELECTRIC SOLDERING TOOL

The Thermo-Grip Soldering Tool, manufactured by Ideal Industries, Inc., 5195 Park Avenue, Sycamore, Illinois, has been completely redesigned.

Operating on the resistance heating principle, as other Thermo-Grip models, the new unit heats 20% faster, has thumb switch for close heat control, is light-weight, compact and portable.

The unit includes a transformer or power unit and a soldering tool that operates like a pair of pliers. Holding the work with the plier tool completes the transformer secondary circuit and causes the work to heat instantly. No preheating is necessary. Heat is produced between the electrodes of the soldering tool only, thus concentrating it on the exact spot needed. There is no danger of melting nearby joints or burning other parts.

Handles of the plier soldering tool are made of plastic. Radiating fins isolate the meehanite jaws from the handles to prevent excessive heat conduction. The plier can be locked in any position for special applications by tightening screw at hinge. Secondary leads, made of super flexible power cable and insulated with light-weight woven asbestos, are attached to the side of the jaw for easy handling and cooler operation. The plier is intended for work which may be held in the jaws and heated.

Other types of soldering tools include a pencil for spot soldering and a fork for soldering in restricted places.

The unit is rated at 1000 watts. Case measures 10 $\frac{1}{4}$ " x 8" x 10 $\frac{3}{8}$ " overall.

External dimensions of the principal types of ball bearings have long been made to international standards. Bores, O.D.'s and sometimes widths are measured in the millimeters of the metric system and not inches.

NEW CUTTING TOOLS

Send for our free monthly bargain bulletin on war surplus drills, taps, dies, end mills, milling cutters, reamers, etc.

Machine Shop Supplies

SID TOOL CO.

83 Grand St.

New York 13, N. Y.

BANDED THRUST BEARINGS



REGULAR

OR

**SPECIAL DESIGN
TO 24" O.D.**

We also make Thrust Bearings interchangeable with other manufacturers.

*We take in extra work on
Blanchard Grinders.*

ACORN BEARING CO.

66 Stanley St.

New Britain, Conn.



Grobet
TUBE DEBURRING FILES

**COMBINATION
OUTSIDE and INSIDE**

From 3/16" to 2 1/4" O D in 16 sizes. High speed steel ground from the solid after hardening. Makes 45 chamfer outside, 30 inside. Adjustable to increase or decrease relative chamfer between inside and outside wall of tubing. Speed ranges from 50 to 250 r.p.m. according to size. Also sold in sets in special wooden box. Write for technical details. Order from your favorite supply house.

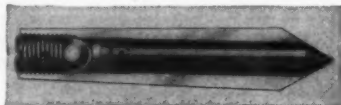
GROBET FILE CO. OF AMERICA

421 CANAL STREET

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★ EVCO REVOLVING TIP LATHE CENTER ★

LOWEST PRICED "LIVE" CENTER ON THE MARKET.



ERNEST H. VANDERWALL CO.

440 Golden Gate Ave.

San Francisco 2, California

\$6.25

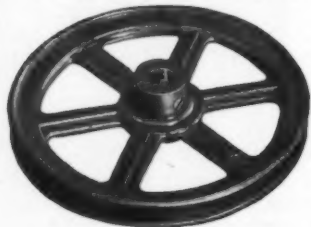
No. 2 Morse
Taper Shank
No. 3—\$7.75
No. 4—\$9.75
Morse Taper

**ASK YOUR
DEALER
FOR
DETAILS**

- Runs cool and yields under load to compensate for work expansion
- Same dimensions as standard solid centers
- No more messy lubrication of work centers
- No more damaged center holes in work
- Accurate quality construction throughout
- Saves time—saves money—saves work

ADDITION TO PULLEY LINE

Congress Die Casting Division announces it is now in production on 11" and 16" pulleys, which gives this pulley manufacturer a complete line from 1½" to 16" diameters. In addition there are full lines of step-cone pulleys, variable speed pulleys and flexible couplings.



The additions to the lines were made possible by the recently completed plant expansion program which has doubled the floor space and more than tripled capacity.

Large stocks of Congress products are carried. Literature is available from Con-

gress Die Casting Division, Dept. BB, 3750 E. Outer Drive, Detroit 12, Mich.

DOW CORNING SILICONES

Dow Corning Corporation announces the issuance of a 12-page catalog of all silicone products now available.

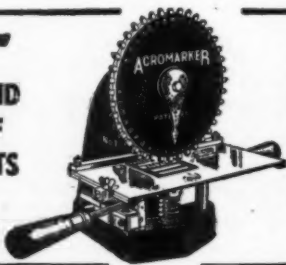
Products described are compounds, greases, fluids, varnishes and resins and elastic silicone materials. Physical properties are told in a series of tables, graphs and pictures, with emphasis on fluids and varnishes. Especially interesting is the discussion of Silastic, a trade name used to identify the elastic silicone materials. When properly cured, it is claimed, their physical and mechanical properties recommend them for industrial applications in which thermal stability, oxidation resistance, waterproofness and good dielectric properties are important.

Catalog may be secured by dropping a card to Dept. BB, Dow Corning Corporation, Midland, Mich.

Pliers may be made to last longer on tough cutting jobs by setting cemented carbide inserts in the jaws.

FAST—

**NUMBERING AND
LETTERING OF
MACHINE PARTS
AND
NAME-PLATES**



ALSO—

**WRITE FOR LATEST BOOK-
LET ILLUSTRATING "100
METHODS AND MACHINES
FOR MARKING."**

ACROMARK

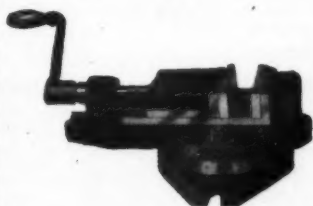
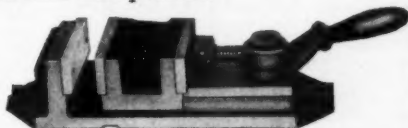
**ELIZABETH, N. J.
15 MORRELL ST.**

"MODERN" VISES

are precision-built with hardened and ground jaws for rapid production work on milling machines, shapers and drill presses.

CAM VISES . . .

Jaw dimensions: width 4" or 5", depth 1½", maximum opening 2" or 3".



. . . SWIVEL VISES 4", 5", 6".

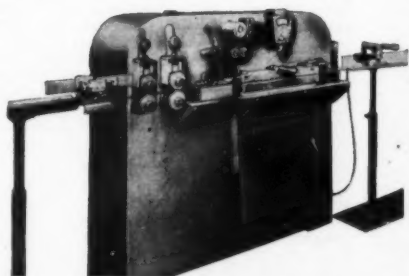
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MODERN TOOLS

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Manufacturers of Precision High Speed
Steel and Carbide Cutting Tools.

Automatic MULTI-TUBE SOLDERING MACHINES



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Capillary Tubing

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★
**BUILDERS OF
SPECIAL
PROCESSING MACHINES**

SEND PRINTS FOR SMALL LOT TUBE SOLDERING JOBS:

. . . SMALL ORDERS OF STRAIGHT AND BENT ASSEMBLIES PROCESSED

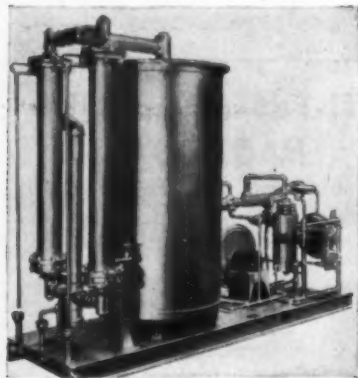
SYRACUSE SPECIAL MACHINE CO. 122 Dickerson Street
Syracuse 2, New York

ATMOSPHERE PRODUCER — OIL FIRED WITH VAPOFIER

The Vapofier gas generating unit which is now serving in over eighty-five types of industrial heat applications, has recently further demonstrated its flexibility by its selection as a means of firing atmosphere producers, which are used in connection with electric furnace equipment.

The Vapofier, utilizing fuel oil, generates Vap-O-gas, which is burned in the combustion chamber of the atmosphere producing equipment. The resulting products of combustion are then taken thru condensers which remove the water vapor and the resulting atmosphere is delivered to the furnace or oven under any desired pressure.

Regardless of the method of combustion and mixing of fuel and air, the maintaining of a constant furnace atmosphere requires a constant fuel to air ratio. The fact that fuel-air ratio may be pre-determined and maintained thruout the entire range of capacity of the Vapofier, without change in the manifold pressure, has proved to be one of the most desirable features of the Vapofier for atmosphere producing purposes.



The flame quality may be varied widely from oxidizing to reducing and once the proper analysis of products of combustion are determined, the unit may be set so that it will constantly produce the same results regardless of demand. Thru the built-in diaphragm control system the Vapofier instantly and automatically adjusts to any variance in requirement without change in flame quality or manifold pressure.

The accompanying illustration shows the Vapofier attached to atmosphere producing equipment developed and used by Hevi Duty Electric Company of Milwaukee, Wisconsin.

The Vapofier gas generating unit is controlled by any standard automatic controlling instruments. The premixing equipment built into the Vapofier is a highly efficient method of mixing any gaseous fuel; therefore, the Vapofier serves ideally where standby facilities for utility gas are of interest.

The Vapofier is efficient and compact, occupying a 2' x 4' space. The units are built with capacities from 70,000 to 2,000,000 B. T. U's. per hour.

For complete details write the Vapofier Corporation, 10316 South Throop St., Dept. R, Chicago 43, Illinois.

PORTABLE AIR OPERATED GUN WELDER

A rocker-type model of a portable gun welder has been placed on the market by the Eisler Engineering Co. Inc., 743 So. 13 St. Dept. 71, Newark 3, New Jersey. The unit is an air operated welding machine with a double acting air cylinder. The air cylinder is placed inside the construction, between the lever arms, and transmits the pressure to the electrodes by lever action.

This cylinder arrangement leaves a free working space all around the horns, thus increasing and easing the welding possibilities especially at hard-to-get-areas. The power part consists of an air-cooled transformer with an 8-tap switch, a pneumatically or electronically actuated timer and a high speed mechanical or electronic contactor for accurately timing the weld in speed or automatic repeat of strokes. The welding cycle is initiated by foot switch or push button. The air system includes solenoid operated air valve, air filter, pressure regulator, gauge and switch and air line oiler.

Transformer and head are connected by a water-cooled low impedance cable and suspended on an overhead beam. Flexible copper straps carry the current from the cable to the electrodes. The horns can be exchanged to fit depths ranging from 8 to 24 inches. The water cooled welding tips are of special high-conductive and wear-resisting alloy. The KVA rating of the welder is from 30 up to 75 KVA.

The machine is suitable for spot welding of sheet metal of light gage, but will also weld heavier work when supplied with short holders.

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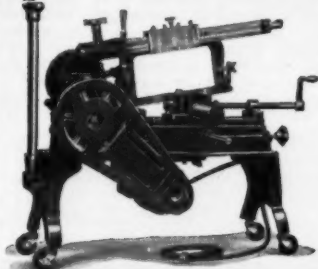


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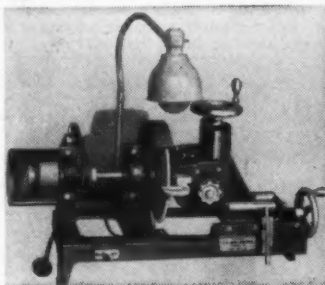
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BOOSTER PUMP TEST MACHINE

A machine, made by Greer Hydraulics, Inc., 454-18th St., Brooklyn 15, N. Y., for testing external or submerged type fuel booster pumps is now on the market. Operating at a flow capacity up to 5400 pounds per hour, pressure up to 100 psi, this machine has an electrical rating of either 12 or 24 volts D. C. up to 30 amps.



The machine is housed in an all-steel cabinet provided with an instrument panel and pump mounting station suitably located for quick operation. The machine is equipped with a remotely controlled rectifier to convert the shop power to D. C. current. The electric circuit is suitably protected against overloads by a circuit breaker.

BEARING DEVELOPED BY SKF

SKF Industries, Inc. announced the de-

velopment of a new type of roller bearing which they claim is capable of carrying heavier loads at higher speeds and lower temperatures.

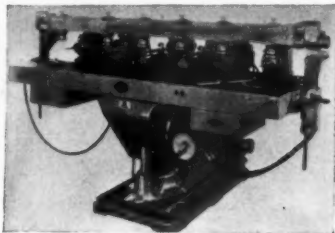
William L. Batt, president, said the spherical roller thrust bearing climaxes a 10 year research program to solve the problem of combining in a single bearing the aforesaid triple features.

The bearing's self-aligning principle which compensates for any shaft deflections, distortions or weaves permits heavy loads to be distributed evenly over all rollers and eliminates danger of overloading. Batt said also that another feature of the bearing is a cage retaining sleeve pressed into the bore of the inner ring, making a contained assembly of the rollers, cage and inner ring.

HOSE ASSEMBLIES ON BORING MACHINES

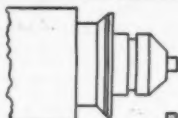
Polyvinyl resin tubing is the development of Resistoflex Corporation, Belleville, N. J. It is a flexible hose assembly which is installed as an integral part of the hydraulic system.

An example of this is the standard use of compar on the boring machines made by B. M. Root Company for woodworking and allied industries. Operated by motor-driven hydraulic oil, these machines have a reciprocating motion, or "feed stroke" as it is called, that develops between the main hydraulic system at the base of the machine and a hydraulically operated work clamp mounted on the boring table.



On the tubing which connects the two vital parts of the borer, an intermittent pressure of 200 lbs. is applied and released on an average of 40 times per minute as the hydraulic oil is forced through the system. A break in the tubing throws the continuous, mechanically sealed oil circuit out of order, causing a shutdown of the machine for replacement of the worn line.

The installation of compar connections has helped solve this problem for the Root Company.



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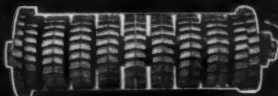
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SUBDIVISION OF WAR PLANT

The recent sale of a Fairlawn, N. J., plant to a group of six different industries is being studied by the WAA as a possible pattern for supplying the industrial space needs of small business.

The average war plant is too extensive to warrant occupancy by a single small volume industry and the New Jersey transaction may serve as a guide to industrial realtors and small business firms requiring additional production space.

The sale was arranged by the Regional Office of Real Property Disposal and engineered thru the office of the David T. Houston Co., of Newark, N. J. The procedure used by the Houston Co., was completely in accord with the policies of WAA to grant special consideration to qualified small business concerns.

The plan originated when the Houston Co. learned that the only space available that would suit the needs of a client was located in the plant formerly operated by the Wright Aeronautical Co. The property had been transferred to WAA for disposition. However, the client needed only a portion of one of the installation's nine structures. Since the client was willing to share a building, the Houston Co. made a careful survey and appraisal of the entire plant to learn just which industries could use the space available. It followed the survey with an intensive solicitation which unearthed applicants for most of the space.

To handle the problems of undeveloped ground at the site, easements, operation of the power plant, watchman service, operation of the cafeteria, parking lots, etc., a company known as Fairlawn Industries, Inc., was also formed by the Houston Co. Membership in the company is held by each of the industries occupying the plant, each firm having purchased stock in proportion to the amount of space it will utilize. The company has also assumed responsibility for selling or leasing the remaining industrial footage. It will operate on a cost plus 10 percent basis.

The plant formerly was used to make aircraft engines. Now it will be used by these firms: The Einson-Freeman Co., lithographers; The Tex-Chem. Co., manufacturers of textile dyes and chemicals; Applikon Inc., textile printers; Keller-Dorian Corp., manufacturers of foils, specialty papers and aluminum products; The National Silver Co., manufacturers and wholesalers of silverware and cutlery; and the Kem Manufacturing Co., a manufacturer of automotive ignition and fuel pump parts.

REBUILDING STANDARDS

The Rebuilding Standards which were given final approval by the MDNA Board of Directors last month are being mailed to the membership for their consideration, will be adopted at the June convention, according to President Harvey Goldman. After being tested for a year, they could be revised if necessary, and then submitted to the American Standards Association for their approval and adoption.

For years, many of the members of MDNA have discussed the establishment of standards to improve the quality of their merchandise and promote fair competition. At the Atlantic City convention, it was decided that a committee be appointed to study the problem of Rebuilding Standards, and submit its findings to the Board of Directors.

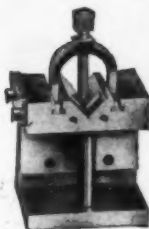
President Goldman, with the suggestions of the Board, appointed the following committee: Messrs. William Sharpe, Chairman, Louis Botwinik, David Kamis, Ralph Hochman, Charles Kempler, Charles Simmons, Jr., Harold Blumberg, and Philip Noll.

The committee promptly collected all the available printed information on the subject, and met frequently in New York for all day sessions. They discussed their problem with numerous rebuilders and users to define their objective, which was a set of standards that would be fair and practical to both buyer and seller.

The committee did an outstanding job and finally submitted their report to the Board of Directors on October 23. The Board was more than pleased with progress made by the committee. While the committee report was approved in spirit by the Board, it was returned to the committee for a few minor changes in language. The changes were promptly made, and the Board voted to approve the Rebuilding Standards.

It is believed that these Standards for rebuilding machine tools will do much to develop a better understanding between the dealer and his customer, giving him a known minimum of standard quality, and in return developing a better reputation and business conditions for the entire used machine tool industry whether the dealer be large or small, a rebuilder or broker for a rebuilder.

Fine dust in the air may stop up combustion-control regulators. One remedy is to put each regulator in a box and attach a compressed air line to build up slight pressure. The positive air pressure keeps fine dust out.



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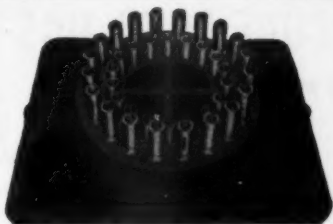
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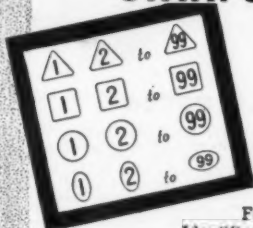
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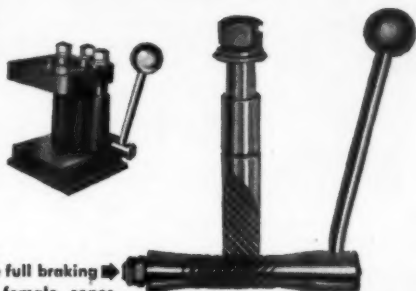
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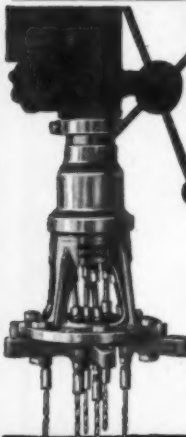
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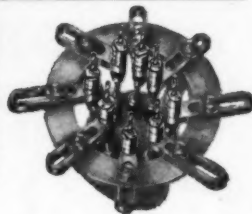
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NEW TECHNICAL BOOKS

PRACTICAL DESIGNS FOR DRILLING, MILLING, AND TAPPING TOOLS

Second edition by C. W. Hinman. 416 pages. Published by McGraw-Hill Book Company, Inc., New York, N.Y. \$5.00.

How many tool engineers are completely satisfied with the knowledge they possess about tools from the drafting table to actual operation? How many novice designers wish they possessed more knowledge and could find it easily?

This book purports to answer questions consciously or unconsciously posed by both experienced and inexperienced tool designers with respect to jigs, fixtures and accessories as used in modern drilling, milling and tapping practice. Mr. Hinman goes into exhaustive detail, even to a discussion on suitable filing systems for blueprints.

A few of the subjects covered under drilling are types of commercial jigs and fixtures, drill jigs in which the positions of guide bushings can be changed, drills for cutting hardened tool steel, etc., under milling; cam operated fixtures for automatically controlling the relation between work and cutter, rise and fall milling machine, carbide tipped cutting teeth using a negative rake, etc., under tapping; air controlled threading operations, a high precision automatic machine for tapping nuts with a hook

tap, fixtures in which the work can be shifted into positive positions to align the holes for tapping, etc.

Single chapters are devoted to tool engineering tables, list of visual aids available, shop mathematics which presents formulas for computing machining cost, speeds, feeds and time, heights of drill points, etc. There are nearly 400 photos and drawings representing 90% of key designs used in tools for presswork.

The book should serve as a useful reference guide.

• • •

PITFALLS TO AVOID IN LABOR ARBITRATION

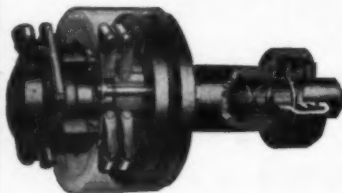
Prepared by "Labor Arbitration experts" in collaboration with the editorial staff of Executive's Labor Letter. 56 Pages, Spiralbound. Published by National Foremen's Institute, Inc., Deep River, Conn. \$5.00.

The theory is here advanced that unions are more adept at the art of bargaining than management because such negotiations form the very basis of a union's existence. On the other hand, a labor dispute is not a regular part of the day's work for management, being far from routine. Educating management so that it can compete on an equal footing with the union is the purpose



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of the book, which thoroly discusses such subjects as the Arbitration Tribunal, Organization of an Arbitration, Procedure, Preparing the Case, Award, and Law of Arbitration.

One way in which management can present its side of the case effectively is by adequately preparing its case before arbitration takes place. Suggested points along which to work are given in the section headed, "Preparing the Case." These include choice of an experienced representative (preferably in labor relations), conduct at the sessions as compared to conduct at a courtroom, and specific types of preparation on wages, hours, working conditions, discharges and interpretation of contract.

In view of recent union-management trouble, the book is a valuable description of what management should know before it approaches arbitration sessions.

MAGNESIUM FABRICATION

By Lothair B. Harkins. 149 pages. Published by the Pitman Publishing Corporation, 2 West 45th St., N. Y. 19, N. Y. \$2.75.

Presented is authoritative data on all phases of the fabrication of magnesium-alloy sheet, extrusions and tubing into the finished product. Because only a limited number of workers skilled in light-metal fabrication possess experience in magnesium alloy, this book has been written. It is an explanation of these techniques and is directed chiefly to the student and the man on the job rather than to the engineer.

Present and prospective shop owners, however, interested in the possibilities of magnesium fabrication will find the discussion of Industrial Contacts helpful for the purpose of seeking practical advice before any money is invested in expensive equipment.

The author includes a chapter on inspection of magnesium, valuable not

only to inspectors, but also to the workman.

Before magnesium can assume a position as one of the major industrial materials, its merits must first be sold to both manufacturers and consumers. Widespread beliefs that magnesium alloys burn easily and have low resistance to corrosion must be dispelled. The book claims that these faults have been corrected by increasing knowledge of alloying, and points out other advantages as good machining qualities, hot forming advantages, and lightness and ease of working magnesium.

This book is the first covering all phases of fabricating magnesium metal, including methods of joining, forming and machining, and would be helpful in making an expert craftsman out of the workman.

A TREATISE ON MILLING AND MILLING MACHINES

Section Two. 326 pages, paperbound. Material compiled from Engineering Staff by Mr. Mario Martellotti, Research Engineer of Cincinnati Milling Machine Co. Published by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. \$1.00.

Milling operations are discussed in terms of elements which combine to make up the total operation, such as cutting speed, feed per tooth, amount of work material removed, chip formation, surface finish and the use and effect of cutting fluids, and power required in milling.

The milling operation itself the author describes as falling into two broad classifications peripheral, when milled surface is in plane parallel to cutter axis; and face milling, when milled surface is in plane at right angles to cutter axis.

Pyramid style of presentation is employed thruout the book. As an example, the chapter on The Milling Process is broken down into such subheads

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as Functional Elements of a Milling Machine, Cutting Speed, Amount of Work Material Removed, etc. These in turn are further broken down into sub-topics such as Effect of Speed on Cutter Life, Relation of Cutting Speed to Work Material, Speed Range in Milling Machines and General Rules for Selecting Cutting Speed under general heading Cutting Speed. Diagrams, tables, formulas and pictures are abundantly sprinkled thruout the book.

This is a book by an engineer and will be of great interest to engineers and technical men.

"LEARNING TO WELD"

"Learning to Weld," published by The Lincoln Electric Co., Cleveland, Ohio, 32 pages, 5 1/4" x 8 3/4", 83 illustrations including photos and drawings, paper cover, price postpaid anywhere in U.S.A. 25c per copy, elsewhere 35c per copy.

"Learning to Weld", provides a simple basic approach for anyone interested in making a start in arc welding. The booklet's purpose is to teach how to weld and to assist in applying arc welding to the repair of broken parts, the hard surfacing of worn parts and the building of miscellaneous equipment.

Subjects treated include the following: protective clothing and equipment; striking the arc; various welding positions; types of welds; fit-up of parts; procedures for various welds including fillets in horizontal, flat, vertical and overhead positions, butt welds, lap welds, corner and edge welds; welding cast iron; hard surfacing.

There are four pages containing 22 illustrations of typical applications of arc welding in repair and construction. Also included are conversion tables on decimal equivalents and thicknesses of metal in both gauge and inches. There is also a glossary of welding terms.

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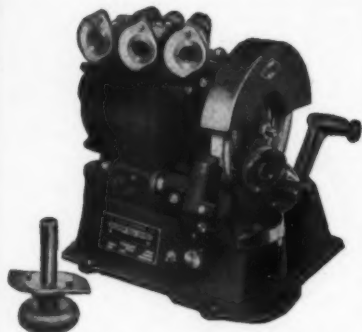
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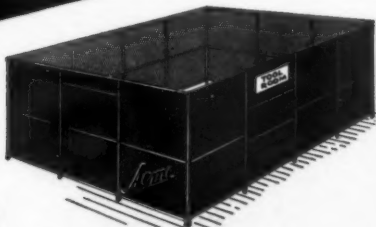
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To help demonstrate its new Dual Drive lathe, The R. K. LeBlond Machine Tool Company have just released a new book, "The Silent Salesman."

The Silent Salesman now makes it possible for the prospective lathe buyer literally to examine the product inside and out without even getting out of his chair.

The book is printed in an entirely new process, permitting the reader to disassemble and assemble the Dual Drive lathe piece by piece right on his desk. The technique used in the Silent Salesman virtually X-rays the lathe in three dimensions and thereby presents a sharp conception of lathe design, construction, and maintenance.

Five colors are used to display the dual driving mechanisms, feed drive, cut sections, and oil lines, and descriptive text matter is keyed to the illustrations.

The Silent Salesman may be seen by requesting a showing from the distributor nearest you. Those who wish a personal copy to keep may obtain it by addressing a request, accompanied by \$1.00 to Dept. BB, the R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

LEWIS-SHEPARD POWER JACKLIFT

Lewis-Shepard Products Inc., has just released an 8-page, illustrated booklet on their New Electric Lift Truck, the Power JackLift. The JackLift comes in two models, the platform model and pallet model.

The booklet devotes a page to model specifications and a page to outline dimensions so that features of each model may easily be seen at a glance. Illustrations show the JackLifts in actual use and diagrams and tables present under-views and overall measurements.

Copy of this booklet may be obtained by writing Dept. BB, Lewis-Shepard Products, Inc., 325 Walnut Street, Watertown 72, Massachusetts.

GRAY PLANER TYPE MACHINES

An eight page booklet describes the new Gray Planer Type Boring, Drilling and Milling Machine. Three large photographs on four pages, taken from different angles, give a full view of the machine.

The feature claimed as most outstanding is the simplicity of operation. It is controlled by electronic drive for all feeds. Few levers and buttons are required for operation. The machine is equipped with safety devices and interlocks in the event of faulty operation. Overload protection for the spindle motor insures stoppage of the feed motors before the spindle motor stops.

The booklet should be referred to for full information and may be obtained by writing to Dept. BB, The G. A. Gray Co., Cincinnati 7, Ohio.

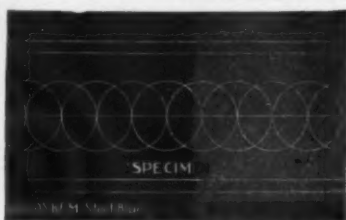
WESTCOTT CHUCKS

Westcott Chuck Company announces a new catalog, No. 700. It is a 12-page illustrated booklet including specifications, diagrams and tables describing independent, universal, combination and light duty chucks in only popular sizes up to 16". Concentration on these certain sizes has been made necessary to assure better production on most needed sizes. Parts and repair service, however, will be maintained for most Westcott chucks now in service.

Those interested in having catalog and price list may write to Dept. BB, Westcott Chuck Company, Oneida, N. Y.

TEMPLETON, KENLY & CO. SIMPLEX UTIL-A-TOOL

Templeton, Kenly & Co., Cicero, Ill., manufacturers of Simplex Jacks for use by mines, railroads, industrial engineering and construction, has recently issued a new descriptive bulletin on its Simplex Util-A-Tool. Designed to facilitate industrial plant applications such as main-



DYKEM STEEL BLUE STOPS LOSSES making dies & templates

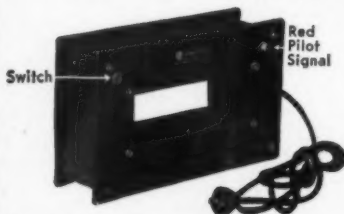
Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY

3301G North 11th St., St. Louis, Mo.
In Canada: 2466 Dundas St. West, Toronto, Ont.

AMC Quick DEMAGNETIZER



A necessity where machine tools are used.

Standard units available and special sizes to order.

Write today for descriptive circular.

ALOFS MFG. CO.

1629 Madison

Grand Rapids, Mich.

tenance, repair and production, this set No. 610 as outlined in the bulletin provides multi-purpose equipment that pushes, spreads, pulls, clamps and lifts easily and efficiently.

The center spread of the bulletin describes in detail the various industrial plant uses of the Util-A-Tool. Specific operations outlined include (1) pushing objects apart, moving machinery, straightening frames and structural members, (2) pulling in structural members, bulged car and truck sides, car doors and other frozen or wedged member, (3) pulling machinery or engines on skids, and in wrecking work, (4) lifting or lowering for installation of heavy machines, tanks or beams and (5) pulling spoked or solid center wheels and gears, pinions and bushings.

Listed on the bulletin's back page is a wide selection of push-and-pull jacks and steamboat ratchet pulling jacks. Specification charts and price listings on these and the Util-A-Tool are included. For full information on any of the Simplex jacks write for Bulletin P & P 46, Dept. BB Templeton, Kenly & Co., 1020 S. Central Ave., Chicago 44.

NATCO HOLEWAY MACHINES

National Automatic Tool Co. presents a 28-page booklet which describes performances possible with the use of their machines. Among other examples, the booklet relates the way in which one of their processing machines performs 172 drilling, countersinking, counterboring, chamfering, reaming, and tapping operations simultaneously. Diagrams clearly illustrate the schematic outline of operation, and pictures of machines are numerous.

A card or letter addressed to Dept. BB, National Automatic Tool Co., Inc. Richmond, Indiana will procure the booklet.

MURRAY BLAST COILS

A catalog describing "GRID" Blast Coils has just been published by D. J. Murray Manufacturing Co., Wausau, Wisconsin. It contains a detailed description of the one piece high test cast iron construction of the "fin" heating sections, the exclusive feature of "GRID" Blast Coils.

Diagrams of installations, performance charts, temperature differential conversion tables, physical data, and specifications are included in this catalog. Listed are the classifications of industries that are now using "GRID" Blast Coils. Free copy of the catalog upon written request to Dept. BB, D. J. Murray Manufacturing Co., Wausau, Wis.

HEWITT RUBBER TRANSMISSION BELTING

Specifications and construction features of Monarch brand transmission belting are outlined by Hewitt Rubber division of Hewitt-Robins, Inc., in a new four-page product folder now being distributed.

Monarch is claimed to withstand the shock loads of the heaviest service and to be especially effective when used in pulp and paper mills, stone crushing plants, mines, quarries, foundries, saw mills, oil fields, sugar fields and other power transmission operations. All plies are straight-laid under uniform tension, assuring greater freedom from stretch and increased power delivery. Absence of folds and seams makes it possible to apply either side of the belt to the pulley.

Copies of the printed folder may be obtained by writing Dept. BB, Hewitt Rubber, 240 Kensington Avenue, Buffalo 5, New York.

BURRELL POLISHING CLOTHS

A handy file brochure on polishing cloths and abrasives, produced by Burrell Technical Supply Company, is now available to metallurgists and metallurgical chemists.

Listed on one of the inside pages of the four-page folder are polishing and abrasive materials according to catalog number. On the opposite page, the polishing cloth samples are arranged in the order of their quality.

Folder may be obtained by sending request on letterhead to Dept. BB, Burrell Technical Supply Co., 1936 Fifth Avenue, Pittsburgh 19, Pa.

PYROMETER TEMPERATURE INSTRUMENTS

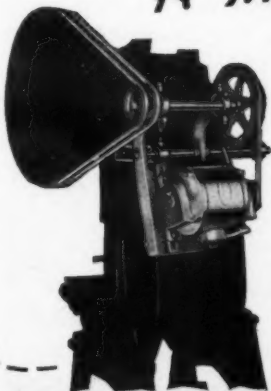
The Pyrometer Instrument Co. has issued a 4-page folder describing the various pyrometers they have developed to meet special temperature control requirements of industry.

It is claimed these pyrometers possess dust and fool proof qualities, are automatic, simple to read quickly and accurately, and adaptable to problems arising daily in plants and laboratories.

The booklet includes pictures and descriptions of optical, radiation, surface, immersion and indicating pyrometers. It may be obtained from Dept. BB, The Pyrometer Instrument Co., 103-105 Lafayette St., N. Y. 13, N. Y.

A Modern

MOTOR DRIVE FOR EVERY MACHINE TOOL



The Modern Motor Drive shown here fills an urgent demand for an easily mounted economical Punch Press Drive.

Utilizing the jackshaft principle, permitting the use of standard 1750 R.P.M. Motors.

Brackets for direct drive from motor to flywheel are also available from stock.

Write for catalog showing complete line of Modern Drives for other machine tool equipment.

THE NICHOLS ENGINEERING COMPANY...

2400 W. MADISON ST.

CHICAGO 12, ILL.

Mechanics Through the Ages



EARLY LAST CENTURY 'JAM PLATES' WERE COMMONLY USED TO JAM THREADS ON BOLTS. THESE OBLONG, CONVEX-SIDED STEEL PLATES, FITTED WITH IRON HANDLES AND EQUIPPED WITH SEVERAL HOLES TOLERABLY WELL THREADED, WERE JAMMED ON POINTED BOLTS AND SCREWED DOWN, FORCING OUT THREADS.

ALTHOUGH MINED IRON IS NEVER FOUND COMBINED WITH NICKEL, THE PRIMITIVE WEAPONS AND UTENSILS MADE BY PREHISTORIC MAN OFTEN CONTAIN THIS ALLOY! THEY APPEAR TO HAVE USED METEORIC IRON, WHICH DOES CONTAIN NICKEL, FOR THEIR WORK.



THE WORD 'TEMPLET'

OR 'TEMPLATE' DERIVES FROM THE LATIN *TEMPLATUS*, A WOODEN FORM USED BY ANCIENT MASONS WHEN LAYING THE ARCHES OF A VAULT. GRADUALLY THE TERM CAME TO MEAN ANY FORM USED IN LAYING OUT OR CONSTRUCTING WORK.

The **HEVI DUTY CARBURIZER-NITRIDER** *Bulletin* HD-646



The new issue of this bulletin is now ready for distribution. Twenty-eight pages of tables, charts and production installations describing this all-purpose furnace which has become standard heat treating equipment in many industrial plants.

Send for your copy of Bulletin HD-646 - today.

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES **HEVI DUTY** ELECTRIC EXCLUSIVELY
MILWAUKEE 1, WISCONSIN

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365



PRECISE 40

1/5 H.P. - 40,000 R.P.M.

USE IT FOR FASTER, SMOOTHER WORK
ON STEEL, IRON, BRASS, BRONZE, WOOD,
PLASTICS, GLASS AND OTHER MATERIALS.



GRINDS
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POLISHES
FINISHES



Speed with power with precision—that's the new PRECISE 40. Surpasses our own PRECISE 35 which outworked every tool in the field. In strong, light plastic case, PRECISE 40 weighs only 40 oz. —packs a record 1/5 H.P. New type quill mounts precision collet chuck or grinding wheel arbors of various sizes; push-button spindle lock for quick tool change. 90% greater cooling; four oversize ball bearings. Quickly lubricated by pressure gun through ball-valve inlets. Tool mounts in vise, lathe, stand, or milling machine or can be used with PRECISE accessories for special applications. Guaranteed shockproof without ground wire.

Send for this 6-page Bulletin
PRECISE PRODUCTS COMPANY
1331 CLARK ST., RACINE, WISCONSIN

PRECISE 40

RADAR

Radar transmission and reception is roughly comparable to ordinary broadcasting and receiving; the main difference is that in radio, the broadcast signal is picked up by widely scattered receiving sets, while in radar, the transmitting and receiving stations are located in the same place. A single antenna is commonly used to do both sending and receiving. First, a powerful burst of energy is projected from the antenna transmitter. This beam eventually meets with a target, either an object or a land mass. The portion of the

beam striking a target literally bounces back to its starting point; radar units work on the echo principle. Only a fraction of a second of silence intervenes between the initial projection and the reception of the return signal.

The development of radar not only made tremendous progress during the war, but gave a great impetus to research in related fields in peacetime. The rapid advance made in radio tubes capable of generating large amounts of power at extremely high frequencies is creating better frequency modulation radio and television equipment, because the frequencies required in these sets are closely related to those in radar equipment.

The two important fields in which high-frequency energy plays an important role are induction heating and dielectric heating. In the first, radio energy creates an electromagnetic field surrounding a copper coil; metal placed in this field is heated by induced radio frequency current flowing on the surface of the metal; metals can be made red-hot instantaneously while floating in free space, although the coil remains stone-cold.

Dielectric heating is used for materials that are non-conductors of electricity—wood, plastics, etc. The material to be heated is sandwiched between two electrically charged metal plates. The charge agitates molecules of the material, creating heat by molecular friction.

Producers of Screw Machine Products to Specifications

ONE, FOUR and SIX spindle automatics maximum capacity 2½" round. Hand Screw Machines and Universal Turret Lathes maximum capacity 3" round. Castings and Forgings machined maximum 10" diameter, 8" length, 15 pound weight. Secondary operation equipment for milling, drilling, tapping and assembling. Fabricators of aluminum, brass, steel and their alloys.

SCREW MACHINE SPECIALTY CO.

5600 Butler St., Pittsburgh 1, Pa.

COOLANT PUMP

At last, a dependable, low price coolant pump for machine tools. Constructed of non-corrosive materials. Plastic screen quickly removed for cleaning. Fully guaranteed by old, reliable manufacturer.

With this pump and small pan for fluid you obtain the same results as with expensive equipment.

May also be used for Evaporative Coolers, Fountains, Displays, etc.

Write for Folder

LIST PRICE—POSTPAID

\$19.50

ROBBIE AND DEALER
INQUIRIES INVITED



Evaporative Cooler Kit
This kit provides all of the essentials for Evaporative Coolers: Pump, Floor Valve and Switch.
Complete Kit for
LIST PRICE 25.50

AMERICAN METAL PRODUCTS CO.

FORT WORTH 9, TEXAS

SEE BETTER with a MAGNI-FOCUSER

The Best Eye Aid
for

- LATHE WORK
- BENCH WORK
- SAW FILING
- REWINDING MOTORS
- TOOL AND DIE WORK



Pat. U.S.A.

EVERYONE in your plant who does precision work can do it easier, faster and better by wearing a Magni-Focuser. This binocular eye-loop enables you to see an object sharply magnified with the comfort and clarity of normal vision. Relieves eye-strain—lessens fatigue—reduces accidents. Allows free use of both hands. Available in different magnifications, from 2½ at \$8.50 to 3½ at \$10.50. If your distributor cannot supply you, order direct. Money refunded if Magni-Focuser does not help you see better.

EDROY PRODUCTS CO.

478 Lexington Ave., New York 17, N. Y.



CLOSED

TRADE

AUTOM

CLOSED

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Plain Type

Offset Type

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO.

1110 E. 87TH ST.
CHICAGO 19, ILL.

SPECIFICATIONS:
Open Width ¼" to 6"
Gate Material .040 to .125
Pin Diameter .101 to ¾"
Lengths to 120"

THREE-FOURTHS OFFSET

SEMI-OFFSET

NOW! HEXAGON AND SQUARE

Precision Collets

24 HOUR DELIVERY!

FOR ATLAS • LOGAN • SOUTH BEND
SHELDON • HARDINGE • CLAUSING
ELGIN • CRAFTSMAN LATHES, ETC.
BROWN & SHARPE MACHINES AND
MANY COLLET CHUCK ATTACHMENTS

HEX OR SQUARE Collets needed for that new job? Then say "PRECISION Collets, please!" to your industrial distributor. You'll get them now when you want them . . . from stock. And you'll get them as you want them . . . ground dead true, with a spring temper that spells assured performance, and with long life guaranteed.

PRECISION Collets fitting most popular machines and attachments are stocked in ROUND, HEXAGON and SQUARE sizes. Order them from leading distributors throughout the country, who serve industry well.

Our new catalog of PRECISION Collets and Lathe Attachments is ready — Write for it!



GENERAL DIE AND STAMPING COMPANY
262-272 MOTT STREET • NEW YORK 12, N. Y.

MAINTENANCE OF FIRE EXTINGUISHERS

Fire extinguishers are first-aid equipment. They must be rushed into action quickly to extinguish small fires and prevent them from becoming conflagrations. Therefore the extinguishers must be ready to operate upon immediate demand; they should be periodically inspected and recharged.

A definite person should be assigned the responsibility for the proper maintenance of fire extinguishing equipment at a plant—a maintenance foreman, a guard, anyone qualified to handle the job. He should

supervise inspections, have charge of the records, and recharge the equipment besides actually serving as fire chief when occasion demands.

Keeping records of the types of extinguishers, including model and type, date of last recharge, is an essential step in maintenance. A linen tag attached to the extinguishers, with space provided for tabulating inspection data is a useful addition.

Various extinguishers are required for different types of fires. The Underwriters' Laboratories Inc. have classified these into three types. Class A fires are those in ordinary combustible materials where water is required as a quenching agent. Class B fires are those of flaming liquids or greases which must be blanketed or smothered to put them out. Class C designates fires in live electrical equipment which call for a non-conducting agent.

The location of the particular type of extinguisher to combat the fire most likely to occur in that vicinity is important. The equipment should be placed close to the potential fire, but not too close, since it might prove impossible to reach in the event of a sudden blaze, or a spill fire, such as flaming oil. Extinguishers should be placed where instantly available when needed, and their locations and the type plainly indicated. Periodical demonstration of equipment as a reminder to personnel proves a practical aid in keeping fires at a minimum.

★ THE ★ WONDER CUTTER

The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely.



Hand operated. A giant for work, cuts wire and rods up to $\frac{3}{8}$ -in. round or $\frac{3}{8}$ -in. square and band iron up to $\frac{1}{2}$ in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices.

THE FEDERAL FOUNDRY SUPPLY CO.

4602 East 71st St.,

Cleveland, Ohio



when you want Speed-
when you want power-

...in your job of sanding, filling and rubbing, drilling or screw-driving, you want a Strand Flexible Shaft machine, because a Strand will do it faster, better, and stand up to it longer.

Strand Flexible Shaft machines provide constant speeds with greater operator convenience. Hundreds of attachments easily interchanged—125 types and sizes—models include vertical and horizontal type machines from $\frac{1}{8}$ to 3 h.p. Distributors in all principal cities.

Send today for catalog showing complete line



Strand
FLEXIBLE SHAFTS

N. A. STRAND & CO.

5016 NO. WOLCOTT AVE. CHICAGO 40, ILL.

Speed Up GRINDING JOBS

With Automatic DIAMETER INSPECTING GAUGE



Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

American

DIAMOND TOOL & GAUGE CO.

15920 WOODINGHAM • DETROIT 21, MICH.

Send for Bulletin

PACKAGING METAL PRODUCTS

The Dow Chemical Co. of Midland, Mich. has developed several highly efficient and scientifically perfected methods of packaging metal parts and products. Demands resultant from the recent conflict have necessitated the shipment of thousands of parts and machinery of all descriptions over long and difficult routes. To insure adequate protection, various types of materials have been perfected. One of these methods is the application of a preservative directly to the part or assembly, and further surrounding it by an unsealed wrapping. Another type of

treatment is the application of a preservative directly to the parts, then enclosing them in a sealed waterproof wrapper.

For precision parts such as electrical equipment, up to 25 lbs. in weight, requiring unusual precaution against moisture, the equipment is placed with a desiccant (agent for dispelling moisture) in a carton which is sealed in a moisture proof and liquid waterproof bag, then placed in a tight outer container. A variant of this, used in bulkier shipments, is to include a skid or cradle to which the part is rigidly fastened, and seal the mounting posts and brackets from the outside so that the joints are as impervious to moisture as the barrier itself.

Further effective ways of protection from moisture, combustion, aging, damage from light, sub-zero or intense tropical temperature, and the danger of exposure to chemical corrosives have been achieved

by the further development of a plastic film (Saran - film) and a dipping agent (Stripcoat) which surround the entire object for packaging. These developments have been subjected to stringent tests to determine their reactions to various extreme conditions. It was learned that by dipping small non-precision parts in a solution of Stripcoat they could be crated at once, with the further advantage of eliminating the arduous process of unpacking upon their receipt.

Choice of package, however, is ultimately dependent on mode of transportation, size, weight, and shape of package.

SYNTRON

DEPENDABLE

ELECTRIC HAMMERS



DRILL —

**CUT and
CHANNEL in
Concrete and Masonry**

Easier — Faster — Cheaper

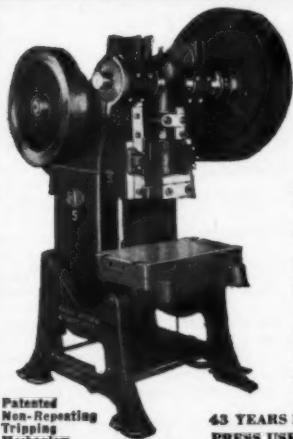
**3600 powerful blows per minute
Light socket operation**

Write for Folder No. 5-46

SYNTRON CO.

300 LEXINGTON

HOMER CITY, PA.



Patented
Non-Repeating
Tripping
Mechanism

UNLIMITED PEAK PRODUCTION

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

If you want the best, send for illustrated catalog describing complete line TODAY.

With Modern



**43 YEARS ENGINEERING EXPERIENCE BUILT INTO EVERY JOHNSON
PRESS USED BY LEADING MFR'S. THROUGHOUT THE WORLD.**

JOHNSON MACHINE AND PRESS CORP., ELKHART
INDIANA

BUTT WELD



BH10

EASIER!

FASTER!

BETTER!

with a

LARKIN

With this hand-operated Larkin (10 K. V. A.) you not only can butt weld up to $\frac{1}{2}$ " in diameter — and weld other forms of similar overall size end-to-end — you can do a *faster, cleaner, easier* welding job. The Larkin leads the butt-welding field with solenoid-operated contactor which gives instantaneous control . . . cam-locked jaws which require less pressure on hand levers . . . pressure application while heat is on or off . . . changeable dies to fit every contour . . . five heat stages . . . and many other features which save repairs, speed production.

Larkin ARC-WELDERS save money, too!

Larkin heavy-duty arc-welders have a record for fast, strong welds at lower wattage. Known for steady voltage . . . smooth flow . . . better control . . . wide range . . . easy arc . . . uniform welds at all heats. Sizes from 75 to 500 amperes.

There's a Larkin Welder for every purpose — arc, spot, projection and butt.

Send for Prices and Full Details Now To

LARKIN LECTRO PRODUCTS CORP.

156 W. 146th Street

New York 30, N.Y.

UNEMPLOYMENT COMPENSATION

"New Merit Rates—Tax Savings—Available Jobs" was the subject of a recent talk by Samuel C. Bernstein, Commissioner, before the Illinois Division of Placement and Unemployment Compensation.

According to Mr. Bernstein, merit rating exists "to allocate the cost of the Unemployment Compensation program according to the unemployment risk, and—to provide employers with an incentive for the stabilization of their employment."

He explained that the merit rating of a company depends on three factors—(1)

employer's benefit wage ratio, (2) unemployment experience of the state as a whole, and (3) the size of the fund.

The employer's benefit wage ratio is arrived at by dividing three years' calendar yearly wages of employees who have drawn at least three full weeks of compensation by the employer's taxable pay roll for the same period.

The state experience factor is measured by the ratio of unemployment benefits paid to the total charges made against employers' accounts.

The state experience factor is adjusted upward and downward depending upon the amount of money on hand at the time. If there is an overabundance of money in the fund, the experience factor is adjusted downward, and vice versa.

Because of reconversion, material shortages, etc., 1946 was the first year in which payments exceeded contributions. Approximately 43 million was collected and benefit payments totaled 77 million, or almost double. High employment during 1942 through 1945 was responsible for the low amount collected.

1947 represents a downward employment trend with only 79% of Illinois firms paying minimum rate of 0.5% as against 84% for 1946.

Highest rates are paid by members of the seasonal industries. For instance, bituminous coal mining industry led the seasonal group with only 27% paying the lowest rate in 1947; next were construction companies with 45%.

BAUMBACH

THE DIE SET
AUTHORITY

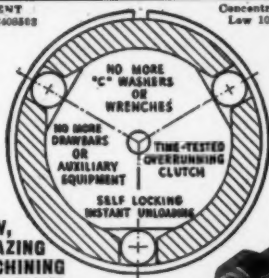


All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO.
1810 S. KILBOURN AVE. CHICAGO 23, ILL.

PATENT
No. 2408508

Concentricity in
Low 10,000ths



NEW,
AMAZING
MACHINING
TECHNIQUE

YOUNG PRECISION EXPANDING
MANDRELS FOR PRODUCTION
OR INSPECTION



Curtiss-Wright Corporation ranks our product with their best tools. Cleveland Graphite Bronze Company, leading bearing manufacturer, states new high accuracy reached, plus substantial production boosts.

ROUGHLY SKETCH DESIRED MANDREL INTO YOUR
PART PRINT AND FORWARD FOR QUOTE.

YOUNG ARBOR CO. • PH. YE-9784
3257 Bradford Rd., Cleveland Hts. 18, Ohio

LET DETROIT POWER SCREWDRIVERS PAY YOU PROFITS

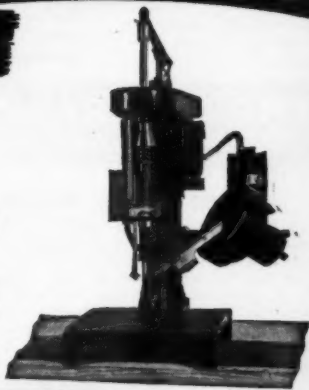
IN TIME AND
LABOR SAVED

Yes, substantial profits through reduced costs and increased production. That's what you gain by using these popular, highly efficient machines — proven through years of constant use.

MODEL A PICTURED

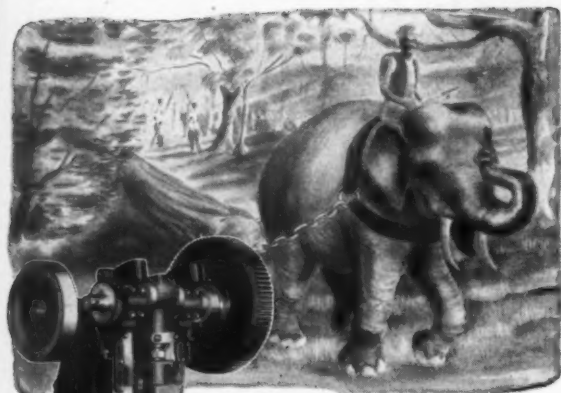
Drives screws from No. 2 x 1/8 to No. 6 x 3/4. A real production machine; drives screws at the rate of one second each. Will not mar screw heads or strip threads. TWO OTHER MODELS, driving screws from No. 6 to 3/8.

Send Sample Assemblies for Estimates
and Free Catalog.



DETROIT POWER SCREWDRIVER CO.

2809 West Fort Street,
Detroit 16, • Michigan



Better Performance On the Toughest Jobs

Put your toughest job on a Federal Press and watch the performance improve. For Federals not only handle with ease the secondary operations common to ordinary presses, but primary and assembly work as well—in some cases perform intricate combinations of all three! Production goes up—costs come down! Write for catalog on the Federal line.

Available in 8 sizes—
capacity, 6 to 80 tons.

THE FEDERAL PRESS CO.

447 Division St., Elkhart, Ind.—Telephone 2831

UNPACKING GRINDING WHEELS

Grinding wheels and other abrasive products leave the manufacturer's plant packed in a manner which should safeguard the contents against the roughest sort of treatment in transit. Care should be exercised when unpacking the wheels, and after unpacking them, they should be inspected to see that the size, grain, grade and other specifications correspond with the original order. The wheel should be tapped with a wooden mallet and a clear ring listened for. They must be perfectly dry and quite free from sawdust when they are tapped. If any wheels should be

received in a broken condition, this should be reported at once.

Grinding wheels are fragile and may be chipped easily or otherwise damaged in moving from one place to another. This is especially true of thin wheels and those having thin edges or faces. A chipped edge or a hidden crack might render a wheel useless for its intended purposes.

Small wheels can be moved easily in wooden boxes and large wheels in trucks.

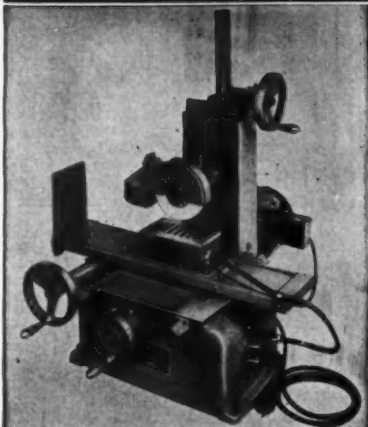
Hand or electric trucks should be padded and the wheels protected from falling or from any hard or sudden blows.

Large wheels are sometimes rolled on their face. This should be done only on a padded and clean floor. Two strips of heavy floor linoleum make an ideal padding as they can be moved progressively along in front of the wheel to provide protection all the way.

In trucking wheels larger than 18 and up to 36" in diameter, it is recommended that they be placed on their edges but tilted back about 15° and with boards or corrugated paper between them. Wheels larger than 36" both for convenience of handling and prevention of breakage, should be carried on trucks which will support them in a vertical position.

Once unpacked, it is important that grinding wheels be stacked or stored properly in order to utilize storage space, to protect the wheels against chipping and breakage and, to make it possible to find a specific wheel promptly.

SANFORD



High-Speed BENCH SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed "For the job that fits in your palm."

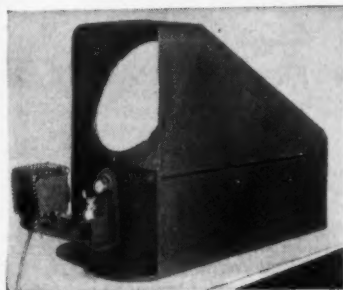
WRITE FOR BULLETIN

SANFORD MFG. CO.

1020-28 Commerce Ave.

Union, N. J.

GOOD NEWS from PORTMAN



Now you can use Optical Projectors anywhere in your shop—to speed up production.

The Portman Model P2.5 Optical Projector is so ruggedly built and so easy to operate that many firms are using them right out in the shop—in places where they can do the most good! When you save on your inspection time you make money. The PORTMAN MODEL P2.5 should help you make this extra money.

The full price is only \$175.00 and deliveries are excellent.

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NACE CORROSION SHOW

The annual all-corrosion Conference and Exhibition of the National Association of Corrosion Engineers is scheduled for April 7 thru 10 at Chicago's Palmer House. This year, for the first time, the proceedings of the Association and the Exhibition will be held under one roof.

The well-filled program cross-sections and holds up for study the latest developments in combating and controlling corrosion, and the Exhibition will feature almost every known method of preventing Nature's attempt to restore to the original crude all types of metals.

Eight technical sessions and 32 technical papers will be presented during the Conference. The meeting will start Monday, April 7, with registration at 9:00 A. M., and formal opening of the Exhibition Hall at 10:00 A. M. In the afternoon, the General Assembly will be called to order at 2:00 P. M. by F. J. McElhatton, president of NACE.

Tuesday morning, papers will be presented on corrosion problems in the water industry. Concurrently, listeners at the Chemical Industry symposium will be appraised of the latest developments in the chemical field.

Wednesday morning, during the Electrical Industry session, such subjects as effects of atmospheric corrosion on guy strand and line hardware, cathodic protection for lead sheath cable, etc., will be discussed. At the same time, in another section of the hotel, papers

will be presented on protection of metal structures in Gas industry. In the afternoon, the Communications and Oil industry symposiums will be held. Wednesday evening, the annual banquet of NACE will take place in the main ballroom of the Palmer House, and F. J. McElhatton retiring President will introduce the new officers.

During the final day of the conference, technical sessions will include papers on the problems confronted in General Industry, covering stress-corrosion, metal fatigue, thermo-galvanic corrosion, inhibitors and embrittlement, metal testing.

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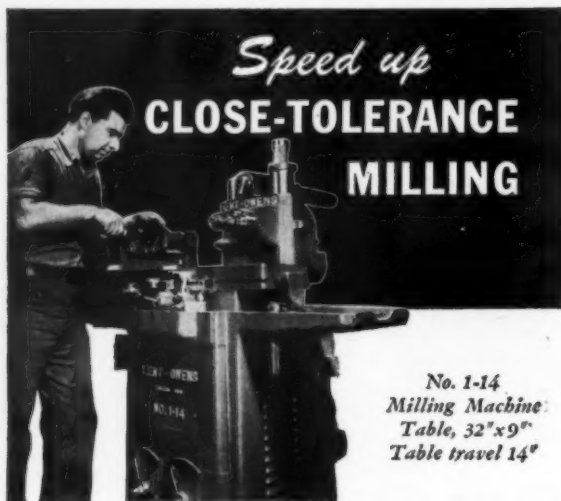
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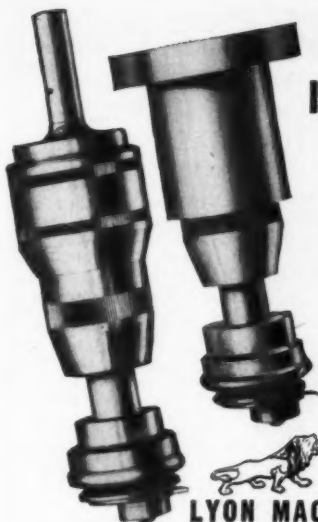
In 1944, production of an adhesive for joining metal to a variety of other materials was undertaken by the Resinous Products and Chemical Co. of Philadelphia, Pa. The product was called Redux and had been developed by Aero Research Ltd., Cambridge, England. Development was spurred on by a need for joining thin metal sheets with maximum smoothness for aerodynamic purposes, without the irregularities that come from riveting or the heat distortion that usually accompanies welding.

The first development work was in the aluminum alloys usually employed in aircraft construction, but Redux soon was found to be equally useful with other metal combinations, various types of cast, extruded and sheet plastics, as well as joining wood to metals and other relatively impenetrable surfaces. A few typical examples are metal clad plywood, as for truck and bus bodies, plywood with internal layers of metal, as for cigaretteproof desk tops, attachment of wood handles to steel knife blades, etc.

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The surface of metals should be cleansed thoroughly of any oil, grease, or other foreign materials with solvent wipe, vapor degrease, or by immersion in a heated acid bath. Then the surfaces should be washed and dried. An alternate method is abrasion by steel wool, sandblasting, etc., after which surfaces should be washed, wiped and dried to remove all dust particles. A slightly roughened, rather than a smooth or polished metal surface is desirable for strong, durable joints.

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Boron Carbide is an industrial material which is developing rapidly as an answer to problems requiring extreme hardness, lightweight and chemical inertness. Although this material has been on the market for several years, it has been largely ignored. It has been employed as abrasive blast nozzles by the Norton Co. A glance at some of the points for and against the use of boron carbide might clarify the situation as to why it has been neglected.

One of its biggest advantages is its high resistance, in finished shape, to acids

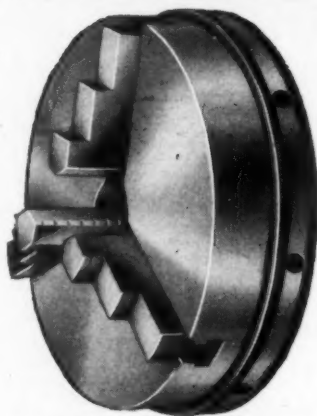
and other chemicals. Tiny ferrous particles from the crushing machines are about the only impurities it is likely to acquire in its production. An acid process can remove such particles, and this treatment has no effect on the boron carbide itself, as has been pointed out above.

Parts of any finished assembly can be cleaned with any cleansers or exposed to any chemicals found in industry without danger of corrosion. The only danger is cement which is used to fasten the parts in place; this must either be shielded or made impervious to chemicals used.

Another great advantage is its hardness. It is second in hardness only to the diamond. Boron carbide, therefore, is extremely resistant to abrasive wear. Parts made of it often far outwear competing materials. But brittleness accompanies this hardness. This

is both an advantage and a disadvantage. The material cannot be bent, dented or deformed by any force less than that needed to fracture it. It can, however, be broken easily enough so that it should not be mounted or supported carelessly. Neither should it be designed into shapes which have sharp edges or unsupported thin sections.

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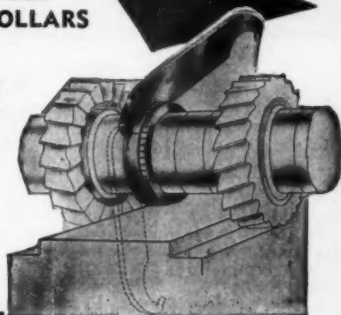
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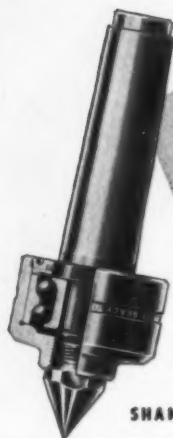
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MANAGEMENT'S RESPONSIBILITY

In an address before the Conference of Management Executives at Skytop, Pennsylvania, Louis Ruthenburg chose as his subject "The Manager and the Working Force."

Mr. Ruthenburg maintained that management's duties consist of satisfying not two but three masters—customers, owners and employees. If any of these get out of hand, harmony naturally will be destroyed. Labor has strayed from the fold and "is causing serious unbalance among

(these) forces." Mr. Ruthenburg believes that management must recognize its responsibility to recreate peace and suggests the following methods by which this job can be done.

"Perhaps management's most constructive and productive role will be that of the leader and teacher. But management cannot effectively lead nor teach the working force merely by adopting resolutions. Management must learn how to lead and how and what to teach."

Too much stock has been put in legislative remedies. The human equation has been lost sight of. Labor is composed of individuals "whose ego demands recognition and satisfaction. . . In the degree to which this universal human want is satisfied we can enlist those forces that are above price. Maximum brain-power and heart-power and cooperation are not purchased by hourly

rates, salaries and bonuses."

Before teaching labor, management must first establish effective channels of communication with the working forces and among its managerial members. Thru education, top executives must learn cooperation. All too often, an administrator continues to view the company in the light of his own special department.

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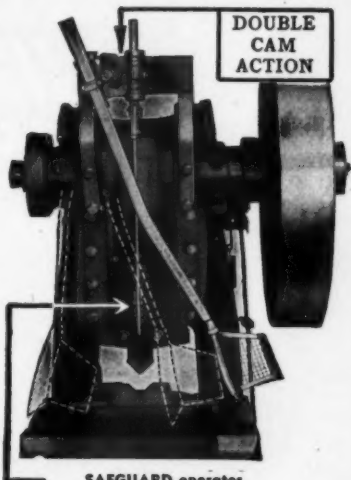
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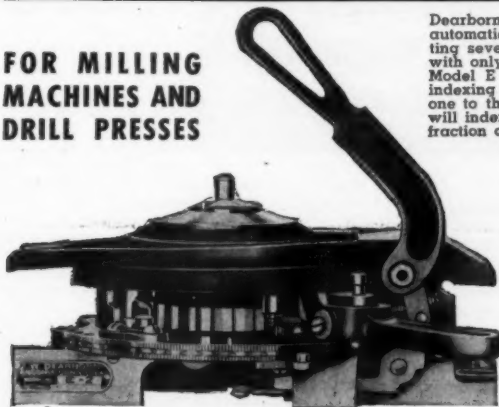
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A development just announced by Carboloy Company, Inc., Detroit, now makes it possible to mount or attach carbide parts with screws, studs, etc., in the same manner and with the same ease as similar parts made of softer metals such as steels, bronze, cast iron, aluminum, etc.

The development tremendously expands the potential fields of application for carbides. It is particularly effective where large carbide sections are to be used. Heretofore, use of large sections of carbides has been handicapped to some extent by the fact that—in the hardened

state—carbides are unmachineable to all practical purposes and cannot be drilled or tapped.

This objection has been overcome by processes thru which machineable materials are solidly imbedded in the carbide parts wherever the part is to be threaded, etc. Outstanding feature of the development is that it includes the ability to use tapped blind holes in the attaching side of the carbide. This in turn means that large "wear parts" may be bolted down rigidly and yet present an unbroken wear surface (no "thru" holes).

When it is desired to attach carbides by means of studs, screws, etc., the approximate location of the point or points of attachment and the number of such points are first determined. The carbide part is then provided with machineable "inserts" in those locations. The part may then be drilled and

tapped at these points either before shipment from the Carboloy Company or by the user "on the job".

While just announced, the method has been in actual manufacturing use for some time in various types of applications made by the Carboloy Company on both small and large parts.

Among the tremendous variety of potential applications are such things as compound, progressive and segmental dies, particularly where blanking is done; wear parts in fixtures, etc.; crank guides; cams; liners for moulds and mills; punches for stamping and other work.

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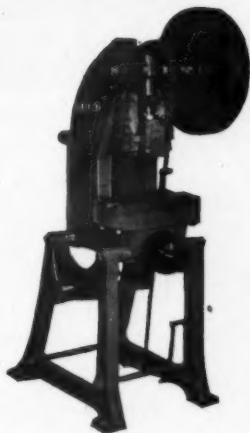
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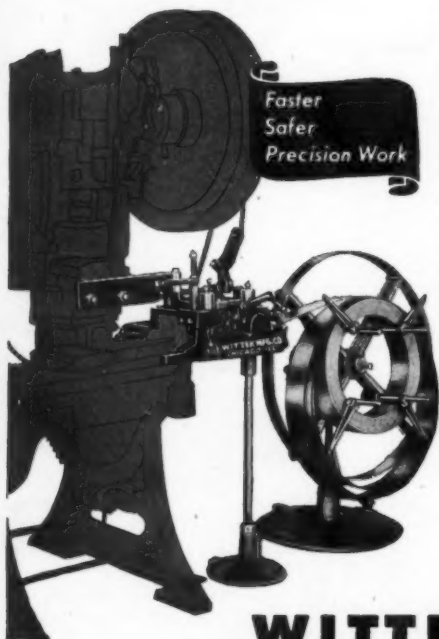
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3	1/8	1	3.60
3	5/32	1	3.66
4	1/16	1	4.74
4	3/32	1	4.74
4	1/8	1	4.86
4	5/32	1	4.98
4	3/16	1	5.16
5	1/16	1	6.06
5	3/32	1	6.06
5	1/8	1	6.24
5	5/32	1	6.42
5	3/16	1	6.72
6	1/16	1	7.86
6	1/8	1—1¼	7.86
6	3/16	1—1¼	8.88
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2 1/2	3/8	7/8	3.59
2 1/2	3/8	7/8	3.78
2 1/2	1/2	7/8	4.15
2 1/2	1/2	7/8	4.15
3	1/4	1	4.10
3	3/8	1	4.10
3	1/2	1	4.35
3	3/8	1	4.54
3	1/2	1	4.79
4	1/4	1	5.04
4	3/8	1	5.67
4	1/2	1	5.67
4	3/8	1	6.36
4	1/2	1	6.36
4	3/8	1	7.12
4	1/2	1	7.12
4	3/8	1	7.75
4	1/2	1	7.75
4	3/8	1	8.38
4	1/2	1	8.38
5	1/4	1	9.00
5	3/8	1	9.00
5	1/2	1	9.00
5	3/8	1	9.55
5	1/2	1	9.55
5	3/8	1	10.52
5	1/2	1	11.46
5	3/8	1	13.42
5	1/2	1 or 1 1/4	13.42
6	1/4	1	11.00
6	3/8	1	11.00
6	1/2	1	11.00
6	3/8	1	11.00
6	1/2	1	11.00
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2 1/2	1 1/4	1	1.95
2 1/2	1 1/4	1	2.58
2 1/2	1 1/4	1	2.71
2 1/2	1 1/4	1	2.90
2 1/2	1 1/4	1	3.09
2 1/2	1 1/4	1	3.21
2 1/2	1 1/4	1	3.53
2 1/2	1 1/4	1	3.78
2 1/2	1 1/4	1	4.35
2 1/2	1 1/2	1	5.42
2 1/2	2	1	6.49
2 1/2	2 1/2	1	7.62
2 1/2	3	1	8.63
3	1 1/4	1	2.39
3	1 1/4	1	3.15
3	1 1/4	1	3.40
3	1 1/4	1	3.59
3	1 1/2	1 or 1 1/4	3.78
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3	1 1/4	1 1/4	6.24
3	1 1/2	1 1/4	6.83
3	2	1 1/4	8.44
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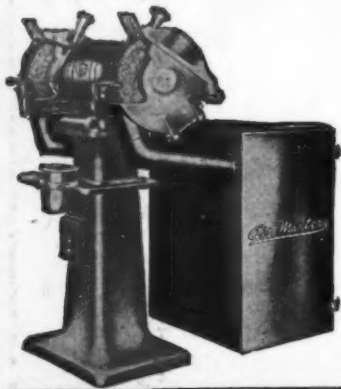
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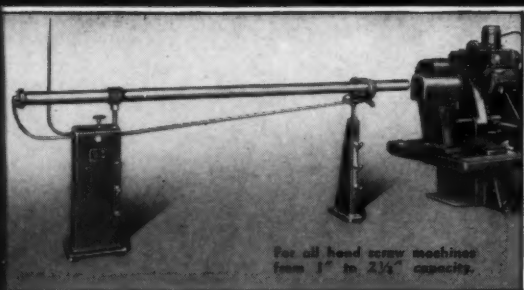
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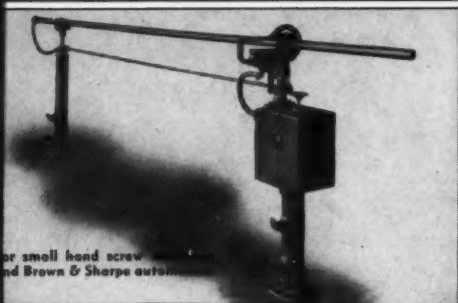
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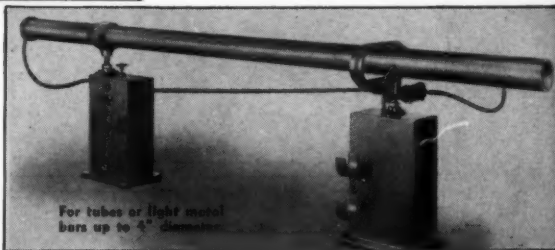
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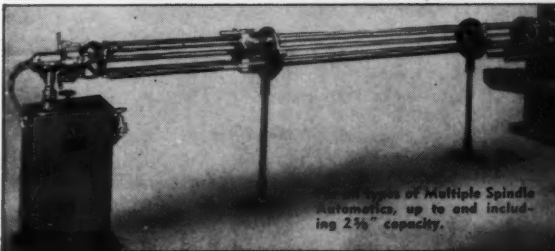
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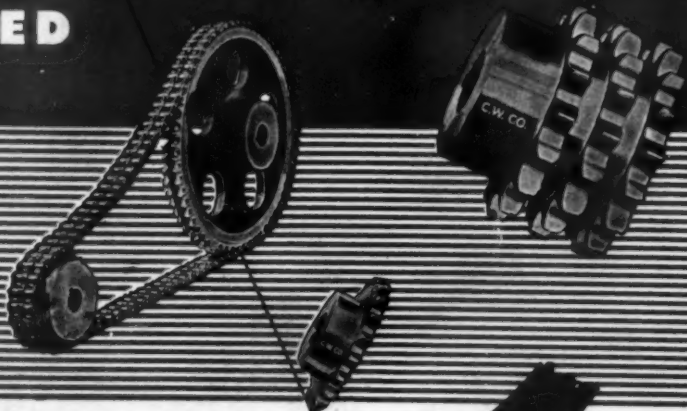


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